

Project Title:

Phase 1-A Short Fork Wastewater Treatment Facility, Mississippi Rivers and Tributaries - Construction

Location:

Near Hernando, DeSoto County, Mississippi

Construction Solicitation and Specifications

THIS IS AN UNRESTRICTED SOLICITATION

Date: DEC 2002

SHORT FORK WASTEWATER TREATMENT FACILITY **DESOTO COUNTY, MISSISSIPPI**

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16426	ENCLOSED CONTACTORS
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GEOTECHNICAL REPORT BY AQUATERRA ENGINEERS, LLC

		1. SOLICITATION NO.		2. TYPE OF SOLICITAT	ION	3. DATE ISSUED	PAGE OF PAGES
SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)		_		SEALED BID (IFB) □ NEGOTIATED (RFP			
IMPORTANT - The "offer" section on the r	everse must be	fully completed by offeror. 5. REQUISITION/PURCHASE REQU	IEST N	n	6. PROJECT	NO	
4. CONTRACT NO.		W38XGR-2309-6369	LOTIN	0.		5-03-B-0003	
7. ISSUED BY	CODE	W38XGR	8. /	ADDRESS OFFER TO			
U S ARMY ENGINEER DISTRIC CONTRACTING DIVISION (CEN 167 NORTH MAIN STREET B20 MEMPHIS, TN 38103-1894	ADDRESS SAME AS BLOCK 7. HAND DELIVERED BIDS RECEIVED 681, CLIFFORD DAVIS FEDERAL I 167 NORTH MAIN STREET, MEMPH			S RECEIVED IN S FEDERAL BUI	LDING,		
A	. NAME			B. TELEPHONE NO. (I	Include area co	ode) (NO COLLECT CALL	S)
	SEE BIDDIN	IG SCHEDULE					
		SOLICITATION					_
NOTE: In sealed bid solicitations "offer" a	nd "offeror" mea						
10. THE GOVERNMENT REQUIRES PERFORMANCE			le, iden	tifying no., date):			
Hernando, DeSoto County, Mississippi, Mississippi Rivers and Tributaries - Construction. The work consists of construction of removal of debris, preparation and stabilization of site, excavation of borrow material, driving of piling, filling of site to finished grade, construction of wastewater treatment facility, landscaping, seeding, fertilizing and environmental protection of disturbed areas. The estimated cost of this work is over \$10,000,000.00. This will be an unrestricted solicitation.							
11. The Contractor shall begin performance	e within	5 calendar days	and co	omplete it within _	510) calendar da	ys after receiving
☐ award, ☑ notice to proceed. ☐	This performand	ce period is 🗵 mandatory,		negotiable. (See	Sec. (00800, Para.	1.1 .)
12A. THE CONTRACTOR MUST FURNISH ANY REQU						12B. CALENDAR DAYS	
(If "YES," indicate within how many calendar days a	after award in Item 12	2B.)				7	
☑ YES ☐ NO						,	
13. ADDITIONAL SOLICITATION REQUIREMENTS:							
A. Sealed offers in original and copies to perform the work required are due at the place specified in Item 8 by 1430 (hour) local time 01/23/2003 (date). If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due. B. An offer guarantee \boxed{\omega} is, \boxed{\omega} is not required.							
C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.							
D. Offers providing less than60	calendar da	ays for Government acceptar	ice af	ter the date offers a	are due will	not be considered as	nd

will be rejected.

					ı					
14. NAME AND ADDRES	SS OF OFFEROR ((Include ZIP Code)			15. TELEPHONE NO. (Include area code)					
					16. REMITTANO	CE ADDRESS (Inc	lude only if differe	ent than Item 14)		
CAGE #:	1	DUNS #:								
CODE	FACII I	TY CODE								
The offeror agrees to perform the work required at the prices specifie by the Government in writing within calendar days after the date stated in Item 13D. Failure to insert any number means the offeror a				e offers are du	e. (Insert any	number equa	ns of this solid	citation, if this r than the mi	s offer is accepted nimum requirement	
AMOUNTS										
18. The offeror agre	ees to furnish	any required p	erforman	ice and payment	bonds.					
20A. NAME AND TITLE C	F PERSON AUTH	ORIZED TO SIGN	OFFER		20B. SIGNATUR	E			20C. OFFER D	ATE
(Type or print)										
			Δ	WARD (To be o	completed by	Government	:)			
22 AMOUNT				Las ACCOUNT	NG AND APPROP	DIATION DATA				
22. AMOUNT				23. ACCOUNTI	NG AND APPROP	RIATION DATA				
24. SUBMIT INVOICES T		WN IN		ITEM	25. OTHER THA	AN FULL AND OP	EN COMPETITIO	N PURSUANT TO)	
(4 copies unless ot	nerwise specified)				☐ 10 U.S.C. 2304(c) () ☐ 41 U.S.C. 253(c) ())
26. ADMINISTERED BY		CODE		•	27. PAYMENT \	VILL BE MADE B	Y			
	C	ONTRACT	ING OF	FICER WILL	COMPLET	E ITEM 28	OR 29 AS	APPLICA	BLE	
document and return to furnish and deliver all i on this form and any conticontract. The rights and o governed by (a) this contract representations, certificati in or attached to this contract.	copies tems or perform all nuation sheets for obligations of the paact award, (b) the sons, and specificat	to issuing office.) I work, requisitions the consideration s arties to this contra solicitation, and (c)	identified stated in this act shall be the clauses,	agrees	summates th	tation, is hereby a le contract, which	ccepted as to the consists of (a) the	red to sign this do items listed. This Government solid er contractual doci	award con- citation and	ffer
30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)				31A. NAME OF CONTRACTING OFFICER (Type or print)						
30B. SIGNATURE			3	OC. DATE	31B. UNITED S	TATES OF AMER	ICA		31C	. AWARD
- · · · · · · · ·					BY					DATE
					וט					

PHASE 1-A SHORT FORK WASTEWATER TREATMENT FACILITY NEAR HERNANDO, DESOTO COUNTY, MISSISSIPPI

SECTION B SUPPLIES OR SERVICES AND PRICES/COSTS

<u>ITEM</u>	DESCRIPTION	<u>U/M</u>	QUANTITY	UI	NIT/PRICE	<u>A</u>	MOUNT
	BASE BID ITEMS						
0001	Short Fork Wastewater Treatment Facility (Excluding						
	Option #1, Option #2, Piling and Lime.)	LS	1.0		·		·
0002	Prestressed Concrete Piling (14")	LF	51,700.0		·		·
0003	Prestressed Concrete Piling (16")	LF	2,460.0	\$	·	\$	<u>-</u>
0004	Lime	TN	3,100.0	\$	·	\$	
0005	Lime-Soil-Water Mixing	SY	190,000.0	\$		\$	·
0006	Allowance for Furnishings	LS	1.0	\$	12,000.00	\$	12,000.00
0007	Allowance for Vegetative Screening	LS	1.0	\$	20,000.00	\$	20,000.00
	TOTAL BASE BID - ITEMS 0001 THRU 0007					\$	·
	OPTION # 1 BID ITEMS						
0008	Influent Pump Station	LS	1.0	\$	·	s	·
0009	Influent Junction Box	LS	1.0	Φ	··		·-
0010	Short Fork Creek 36" Interceptor Sewer	LS	1.0	\$ \$	· · · · · · · · · · · · · · · · · · ·	\$	·
0011	Camp Creek 54" Interceptor Sewer	LS	1.0	\$ \$	·		····
0012	64" Influent Sewer Line	LS	1.0	\$	·	\$	·-
	TOTAL OPTION #1 - ITEMS 0008 THRU 0012					\$	·
	OPTION #2 BID ITEMS						
	ADD Digester, Thickner, Belt Press and Solid Handlings						
0013	Building and DEDUCT Lagoon & Lagoon Appurtenances	I C	1.0	¢.		¢	
0014	(Excluding Piling)	LS	1.0		·	\$	·
0014	16" Prestressed Concrete Piling	LF	1,440.0	\$	·	\$	·
0013	20" Prestressed Concrete Piling	LF	10,800.0	\$	·	\$	·-
	TOTAL OPTION #2 - ITEMS 0013 THRU 0015					\$	
							_
	GRAND TOTAL - ITEMS 0001 THRU 0015					\$	•

LS = LUMP SUM LF = LINEAR FEET TN = TON

SY = SQUARE YARD

SEE NOTES ON NEXT PAGE

Notes:

- Bidders are cautioned to read Contract Clause entitled "NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS" (52.219-4) located in Section 00600.
- 2. The Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement; i.e., option prices will be included in the evaluation for award purposes. See Section 00100, 52.217-5 "EVALUATION OF OPTIONS".
- 3. Evaluation of options will not obligate the government to exercise the options.
- 4. Bidders shall furnish unit prices for all items listed on the schedule of bid items, which require unit prices. If the bidder fails to insert a unit price in the appropriate blank for required items, but does furnish an extended total or an estimated amount for such item, the Government will deem his unit price to be the quotient obtained by dividing the extended Estimated amount for that line item by the quantity. IF THE BIDDER OMITS BOTH THE UNIT PRICE AND THE EXTENDED AMOUNT FOR ANY ITEM, HIS BID WILL BE DECLARED NONRESPONSIVE.
- 5. Award will be made as a whole to one bidder.
- 6. If a bid or modification to a bid based on unit prices is submitted and provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price, including lump sum units, in bid schedule must be stated, or, if it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bid schedule.

Bidders are cautioned to read Contract Clause entitled "Required Central Contractor Registration" (252.204-7004) located in Section 00700.

TECHNICAL POC: JERRY WELCH (901) 544-3236 Jerry.R.Welch@usace.army.mil

ADMINISTRATIVE POC: WENDELL NORMAN 901-544-0775

Wendell.N.Norman@usace.army.mil

INVITATION: DACW66-03-B-0003

PLANT AND EQUIPMENT SCHEDULE

[TO BE ATTACHED TO BID FORM]

	AVAILABLE PLANT TO BE USED								
	*								
No.	TYPE	CAPACITY	MANUFACTURER	AGE & CONDTION	LOCATION				
			*						
			*						

^{*}PROVIDE SEPARATE TABLE FOR EACH TYPE OF EQUIPMENT SUCH AS CONCRETE PLANT, MATERIAL HANDLING, HAULING, ETC. USE ADDITIONAL PAGE IF NECESSARY.

ENG FORM 1619-R

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION. (FEB 1999)

- a. The offeror's attention is called to the Equal Opportunity Clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.
- b. The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participat	tion	:	Goals for female participation
for each trade		:	for each trade
SMSA Counties	32.3	:	
Non-SMSA Counties	26.5	:	6.9

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

- c. The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.
- d. The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the -
 - (1) Name, address and telephone number of the subcontractor;
 - (i) Employer identification number of the subcontractor:
 - (2) Estimated dollar amount of the subcontract;
 - (3) Estimated starting and completion dates of the subcontract; and

- (4) Geographical area in which the subcontract is to be performed.
- e. As used in this Notice, and in the contract resulting from this Solicitation, the "covered area" is Economic Area 055, Memphis, TN, as follows:

SMSA Counties:

4920 Memphis, TN-AR-MS32.3 AR Crittenden; MS DeSoto, TN Shelby, TN Tipton
Non-SMSA Counties
AR Clay; AR Craighead; AR Cross, AR Greene; AR Lawrence; AR Lee, AR Mississippi; AR Phillips, AR Poinsett; AR Randolph; AR St. Francis; MS Alcorn; MS Benton; MS Bolivar; MS Clahoun; MS Carroll; MS Chickasaw; MS Clay; MS Coahoma; MS Grenada; MS Itawamba; MS Lafayette; MS Lee; MS Leflore; MS Marshall; MS Monroe; MS Montgomery; MS Panola; MS Pontotoc; MS Prentiss; MS Quitman; MS Sunflower; MS Tallahatchie; MS Tate; MS Tippah; MS Tishomingo; MS Union; MS Washington; MS Webster; MS Yalobusha; MO Dunklin; MO New Madrid; MO Pemiscot, TN Benton; TN Carroll, TN Chester; TN Crockett; TN Decator; TN Dyer; TN Fayette, TN Gibson; TN Hardemar TN Hardin; TN Haywood; TN Henderson; TN Henry; TN Lake; TN Lauderdale; TN McNairy; TN Madison; TN Obion;
TN Weakley.

(FAR 52.222-23)

General Decision Number MS020020

General Decision Number MS020020 Superseded General Decision No. MS010020

State: Mississippi Construction Type:

HEAVY

County(ies):

PERRY PIKE ISSAQUENA ADAMS ALCORN ITAWAMBA JASPER
JEFFERSON PRENTISS
JEFFERSON DAVIS QUITMAN
JONES RANKIN PONTOTOC AMTTF: ATTALA BENTON BOLIVAR SCOTT CALHOUN CARROLL KEMPER LAFAYETTE SHARKEY CHICKASAW LAMAR SIMPSON LAUDERDALE SMITH CHOCTAW CLAIBORNE LAWRENCE STONE CLARKE SUNFLOWER LEAKE LEE TALLAHATCHIE CLAY

COAHOMA LEFLORE TATE COPIAH LINCOLN TIPPAH COVINGTON LOWNDES
DE SOTO MADISON TISHOMINGO TUNICA MARION FORREST UNION MARSHALL WALTHALL FRANKLIN GEORGE MONROE WARREN MONTGOMERY GREENE WASHINGTON GRENADA NESHOBA WAYNE HANCOCK NEWTON WEBSTER HARRISON NOXUBEE WILKINSON NOXUBEE OKTIBBEHA WINSTON HINDS

HEAVY CONSTRUCTION PROJECTS (including Water & Sewer Lines) excluding all work in conjuction with the Tennessee Tombigbee

PEARL RIVER

YALOBUSHA

YAZOO

Waterway Project.

HUMPHREYS

Modification Number Publication Date 0 03/01/2002

COUNTY(ies):

HOLMES

ISSAQUENA PERRY ADAMS ITAWAMBA PIKE ALCORN JASPER PONTOTOC
JEFFERSON PRENTISS
JEFFERSON DAVIS QUITMAN
JONES RANKIN
KEMPER SCOTT
LAFAYETTE SHARKEY
LAMAR SIMPSON
LAUDERDALE SMITH AMITE PONTOTOC ATTALA PRENTISS BENTON BOLIVAR CALHOUN CARROLL CHICKASAW CHOCTAW LAWRENCE LEAKE CLAIBORNE STONE CLARKE SUNFLOWER CLAY TALLAHATCHIE

LEE LEFLORE CLAY COAHOMA --TATE COPIAH LINCOLN TIPPAH

COVINGTON	LOWNDES	TISHOMINGO
DE SOTO	MADISON	TUNICA
FORREST	MARION	UNION
FRANKLIN	MARSHALL	WALTHALL
GEORGE	MONROE	WARREN
GREENE	MONTGOMERY	WASHINGTON
GRENADA	NESHOBA	WAYNE
HANCOCK	NEWTON	WEBSTER
HARRISON	NOXUBEE	WILKINSON
HINDS	OKTIBBEHA	WINSTON
HOLMES	PANOLA	YALOBUSHA
HUMPHREYS	PEARL RIVER	YAZOO
SUMS2001A		

CONSTRUCTION DESCRIPTION: Heavy Construction (including Water & Sewer Lines) excluding all work in conjuction with the Tennessee Tombigee Waterway Project and Heavy Construction in Jackson County.

SUMS2001A 11/01/1980

	Rates	Fringes
BRICKLAYERS	8.00	
CARPENTERS	6.23	
CEMENT MASONS	5.15	
ELECTRICIANS	9.84	
IRONWORKERS	8.15	
LABORERS:		
Unskilled	5.15	
Pipelayers	5.15	
Drillers	5.15	
PAINTERS	7.00	
PLUMBERS	7.81	
POWER EQUIPMENT OPERATORS:		
Backhoe	5.56	
Bulldozer	5.38	
Crane	6.61	
Dragline	5.94	
Front End Loader	5.40	
Mechanic	8.15	
Motor Grader	5.25	
Scraper	5.15	
Oiler	5.51	
WEIDEDG	for anoft	nonforming on

WELDERS - receive rate prescribed for craft performing operation to which welding is incidental.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

- 1.) Has there been an initial decision in the matter? This can be:
- * an existing published wage determination
- * a survey underlying a wage determination

- * a Wage and Hour Division letter setting forth a position on a wage determination matter
 - * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations

Wage and Hour Division

U. S. Department of Labor

200 Constitution Avenue, N. W.

Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator

U.S. Department of Labor

200 Constitution Avenue, N. W.

Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board

U. S. Department of Labor

200 Constitution Avenue, N. W.

Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final. END OF GENERAL DECISION

General Decision Number MS020036

General Decision Number MS020036 Superseded General Decision No. MS010036

State: Mississippi Construction Type:

BUILDING

County(ies):

DE SOTO

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories).

Modification Number Publication Date 0 03/01/2002

COUNTY(ies):

DE SOTO

SUMS1018A 10/01/1987

	Rates	Fringes
BRICKLAYERS	6.50	
CARPENTERS	6.50	
CEMENT MASONS	6.50	
ELECTRICIANS	7.00	
IRONWORKERS	9.75	
LABORERS - General	5.15	
MASON TENDERS	5.15	
PAINTERS	5.15	
PLUMBERS & PIPEFITTERS	6.00	
ROOFERS	8.00	
SHEET METAL WORKERS	5.45	
TILE SETTERS	7.28	
TRUCK DRIVERS	5.15	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

- 1.) Has there been an initial decision in the matter? This can be:
- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate)ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for

the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations

Wage and Hour Division

U. S. Department of Labor

200 Constitution Avenue, N. W.

Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator

U.S. Department of Labor

200 Constitution Avenue, N. W.

Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board

U. S. Department of Labor

200 Constitution Avenue, N. W.

Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

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SECTION 00100 INSTRUCTIONS TO BIDDERS

CLAUSES INCORPORATED BY FULL TEXT:

52.0-4019 PREAWARD INFORMATION

Each bidder shall, upon request of the Contracting Officer, furnish a statement of whether he is now or ever has been engaged in any work similar to that covered by the specifications herein, the dollar value thereof, the year in which such work was performed, and the manner of its execution and giving such other information as will tend to show the bidder's ability to prosecute the required work. The "such other information" referred to above shall include but is not limited to the following:

- (a) The name and address of the office or firm under which such similar work was performed.
 - (b) A list of key personnel available for the instant project and their qualifications.
- (c) A copy of bidder's latest financial statement, including the names of banks or other financial institutions with which the bidder conducts business. If the financial statement is more than 60 days old, a certificate should be attached stating that financial condition is substantially the same, or if not the same, the changes that have taken place. Such statement will be treated as confidential.
- (d) A list of present commitments, including the dollar value thereof, and name of office under which work is being performed.

52.0-4047 SITE OF THE WORK

Bidders are advised that for the purpose of applicability of the Davis-Bacon Act and other contract labor standards provisions, "the site of the work" under the contract to be awarded pursuant to the solicitation may not be limited to the physical place(s) where the construction called for in the contract will remain when work on it has been completed. The "site of the work" may include other adjacent or nearby property used by the contractor or subcontractors during such construction. For example, fabrication plants, mobile factories, batch plants, borrow pits, job headquarters, tool yards, etc., will be considered part of the site of the work, provided they are dedicated exclusively or nearly so to performance on the contract and are located in proximity to the actual construction location that it would be reasonable to include them.

52.0-4048 QUANTITY ESTIMATES

Estimates of quantities involved in certain items of work for which bids are being solicited on a lump sum or job basis have been made for the use of the Government. Copies of these quantity estimates may be obtained from the U S Army Engineer District Memphis, 167 North Main Street, Room 762, Memphis, Tennessee 38103-1894, telephone 901/544-3236, or visit our website at http://www.mvm.usace.army.mil/

It is to be expressly understood that the accuracy of these estimates is in no way warranted and that the furnishing of this information to a bidder will not relieve him of his responsibility to estimate the quantities involved. It is further to be expressly understood that in no case will such estimate be used as a basis of claim against the Government.

52.0-4049 CONDITIONS AFFECTING THE WORK

Bidders should visit the site and take such other steps as may be reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Failure to do so will not relieve bidders from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government will assume no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of the contract, unless included in the Solicitation, the specifications, or related documents.

52.0-4055 NEGOTIATIONS AFTER SEALED BIDDING

- (a) This clause applies if after bid opening the Contracting Officer determines that all otherwise acceptable bids received are at unreasonable prices, or only one bid is received and the Contracting Officer cannot determine the reasonableness of the bid price, or no responsive bid has been received from a responsible bidder; or the bids were not independently arrived at in open competition, were collusive, or were submitted in bad faith.
- (b) The Government has the option to reject all bids received in response to the sealed bid advertisement and initiate negotiation. Negotiations will include soliciting offers from each responsible bidder that submits a bid in response to the solicitation.
- (c) If after bid opening the Contracting Officer determines under (a) above that negotiations are in the best interest of the Government, the following steps will be followed:
- (1) An amendment to the sealed bid advertisement will be issued to each responsible bidder changing the solicitation number to a request for proposal number. The amendment will also make any necessary changes to the scope of work.
- (2) A cover letter signed by the negotiator will accompany the amendment explaining the procedures to be followed during negotiations.

(3) In the event there is only one responsible bidder under the initial sealed bid solicitation, cost or pricing data requirements set forth in FAR 15.804 will apply as will clause FAR 52.215-2, "Audit and Records - Negotiation".

52.0-4058 PROGRAM DATA

AUTHORITY: The work provided for herein is authorized by the Flood Control Act approved 15 JUN 1936, as amended.

52.0-4060 REVISION AND AMENDMENT TO SOLICITATION FOR BIDS

The right is reserved, as the interest of the Government may require, to revise or amend the specifications or drawings or both prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Solicitation for Bids. If revisions and amendments are of a nature which requires material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the issuing officer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of new date for opening bids.

(FAR 52.236-27) SITE VISIT (CONSTRUCTION) (ALTERNATE I) (FEB 1995)

- (a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, bidders are urged and expected to inspect the site where the work will be performed.
- (b) Two organized site visits have been scheduled for January 9, 2003 and January 16, 2003.
- (c) Bidders desiring a site visit shall contact the Area Engineer at least one day prior to the scheduled site visit.

NAME: Donald R. Tutor Area Engineer

ADDRESS: Wynne Area Office 1932 N. Falls Boulevard P. O. Box 729

Wynne, Arkansas 72396-0729

TELEPHONE: 901/544-3851 or 870/238-7983

COLLECT TELEPHONE CALLS WILL NOT BE ACCEPTED. (End of Provision)

52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 1999)

- (a) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "DUNS" followed by the DUNS number that identifies the offeror's name and address exactly as stated in the offer.
- (b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:
- (1) Company name.
- (2) Company address.
- (3) Company telephone number.
- (4) Line of business.
- (5) Chief executive officer/key manager.
- (6) Date the company was started.
- (7) Number of people employed by the company.
- (8) Company affiliation.
- (c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at http://www.customerservice@dnb.com. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@mail.dnb.com.

(End of provision)

52.211-2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (DEC 1999)

Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained--

(a) From the ASSIST database via the Internet at http://assist.daps.mil; or

(b) By submitting a request to the--Department of Defense Single Stock Point (DoDSSP), Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone (215) 697-2667/2179, Facsimile (215) 697-1462.

(End of provision)

52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989)

- (a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.
- (b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date in the space provided for this purpose on the form for submitting a bid, (3) by letter or telegram, or (4) by facsimile, if facsimile bids are authorized in the solicitation. The Government must receive the acknowledgment by the time and at the place specified for receipt of bids.

(End of provision)

52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)

Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

(End of provision)

52.214-5 SUBMISSION OF BIDS (MAR 1997)

- (a) Bids and bid modifications shall be submitted in sealed envelopes or packages (unless submitted by electronic means) (1) addressed to the office specified in the solicitation, and (2) showing the time and date specified for receipt, the solicitation number, and the name and address of the bidder.
- (b) Bidders using commercial carrier services shall ensure that the bid is addressed and marked on the outermost envelope or wrapper as prescribed in subparagraphs (a)(1) and (2) of this provision when delivered to the office specified in the solicitation.
- (c) Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice.
- (d) Facsimile bids, modifications, or withdrawals, will not be considered unless authorized by the solicitation.

(e) Bids submitted by electronic commerce shall be considered only if the electronic commerce method was specifically stipulated or permitted by the solicitation.

(End of provision)

52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)

Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders.

(End of provision)

52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (NOV 1999)

- (a) Bidders are responsible for submitting bids, and any modifications or withdrawals, so as to reach the Government office designated in the invitation for bids (IFB) by the time specified in the IFB. If no time is specified in the IFB, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that bids are due.
- (b)(1) Any bid, modification, or withdrawal received at the Government office designated in the IFB after the exact time specified for receipt of bids is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late bid would not unduly delay the acquisition; and--
- (i) If it was transmitted through an electronic commerce method authorized by the IFB, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of bids; or
- (ii) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of bids and was under the Government's control prior to the time set for receipt of bids.
- (2) However, a late modification of an otherwise successful bid that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.
- (c) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the bid wrapper, other documentary

evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

- (d) If an emergency or unanticipated event interrupts normal Government processes so that bids cannot be received at the Government office designated for receipt of bids by the exact time specified in the IFB and urgent Government requirements preclude amendment of the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.
- (e) Bids may be withdrawn by written notice received at any time before the exact time set for receipt of bids. If the IFB authorizes facsimile bids, bids may be withdrawn via facsimile received at any time before the exact time set for receipt of bids, subject to the conditions specified in the provision at 52.214-31, Facsimile Bids. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

(End of provision)

52.214-18 PREPARATION OF BIDS--CONSTRUCTION (APR 1984)

- (a) Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.
- (b) The bid form may require bidders to submit bid prices for one or more items on various bases, including--
- (1) Lump sum bidding;
- (2) Alternate prices;
- (3) Units of construction; or
- (4) Any combination of subparagraphs (1) through (3) above.
- (c) If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.
- (d) Alternate bids will not be considered unless this solicitation authorizes their submission.

(End of provision)

52,214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (AUG 1996)

- (a) The Government will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, considering only price and the price-related factors specified elsewhere in the solicitation.
- (b) The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.
- (c) The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the bid.
- (d) The Government may reject a bid as nonresponsive if the prices bid are materially unbalanced between line items or subline items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Government even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

(End of provision)

52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991)

Offers submitted in response to this solicitation shall be in the English language. Offers received in other than English shall be rejected.

(End of provision)

52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)

Offers submitted in response to this solicitation shall be in terms of U.S. dollars. Offers received in other than U.S. dollars shall be rejected.

(End of provision)

52.214-5000 APPARENT CLERICAL MISTAKES (MAR 1995)—EFARS

(a) For the purpose of initial evaluations of bids, the following will be utilized in the resolving arithmetic discrepancies found on the face of bidding schedule as submitted by the bidder:

- (1) Obviously misplaced decimal points will be corrected;
- (2) Discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected;
- (4) Apparent errors in addition of lump-sum and extended prices will be corrected.
- (b) For the purpose of bid evaluation, the government will proceed on the assumption that the bidder intends his bid to be evaluated on basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.
- (c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

(End of statement)

52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a firm, fixed-price construction contract resulting from this solicitation.

(End of clause)

52.217-5 EVALUATION OF OPTIONS (JUL 1990)

- (a) Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).
- (b) The Government may reject an offer as nonresponsive if it is materially unbalanced as to prices for the basic requirement and the option quantities. An offer is unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated for other work.

(End of provision)

52.225-12 NOTICE OF BUY AMERICAN ACT REQUIREMENT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (MAY 2002)

- (a) Definitions. Construction material, designated country construction material, domestic construction material, foreign construction material, and NAFTA country construction material, as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials under Trade Agreements" (Federal Acquisition Regulation (FAR) clause 52.225-11).
- (b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by

paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act or Balance of Payments Program before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

- (c) Evaluation of offers. (1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.
- (2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.
- (d) Alternate offers. (1) When an offer includes foreign construction material, other than designated country or NAFTA country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, designated country, or NAFTA country construction material.
- (2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.
- (3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, designated country, or NAFTA country construction material, and the offeror shall be required to furnish such domestic, designated country, or NAFTA country construction material. An offer based on use of the foreign construction material for which an exception was requested--
- (i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or
- (ii) May be accepted if revised during negotiations.

(End of provision)

52.228-1 BID GUARANTEE (SEP 1996)

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

- (b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.-
- (c) The amount of the bid guarantee shall be twenty percent of the bid price or \$3,000,000.00, whichever is less.-
- (d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.-
- (e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

(End of clause)

52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from

Chief, Contracting Division ATTN: CEMVM-CT – Room 681 U.S. Army Engineer District, Memphis 167 North Main Street, Room B-202 Memphis, TN 38103-1894

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es):

http://www.arnet.gov/far http://farsite.hill.af.mil http://www.dtic.mil/dfars

(End of provision)

252.204-7001 COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE REPORTING (AUG 1999)

- (a) The offeror is requested to enter its CAGE code on its offer in the block with its name and address. The CAGE code entered must be for that name and address. Enter "CAGE" before the number.
- (b) If the offeror does not have a CAGE code, it may ask the Contracting Officer to request one from the Defense Logistics Information Service (DLIS). The Contracting Officer will--
- (1) Ask the Contractor to complete section B of a DD Form 2051, Request for Assignment of a Commercial and Government Entity (CAGE) Code;
- (2) Complete section A and forward the form to DLIS; and
- (3) Notify the Contractor of its assigned CAGE code.
- (c) Do not delay submission of the offer pending receipt of a CAGE code.

(End of provision)

252.236-7008 CONTRACT PRICES - BIDDING SCHEDULES. (DEC 1991)

- (a) The Government's payment for the items listed in the Bidding Schedule shall constitute full compensation to the Contractor for --
- (1) Furnishing all plant, labor, equipment, appliances, and materials; and
- (2) Performing all operations required to complete the work in conformity with the drawings and specifications.

(b) The Contractor shall include in the prices for the items listed in the Bidding Schedule all costs for work in the specifications, whether or not specifically listed in the Bidding Schedule.

END OF SECTION 00100

SECTION 00600 REPRESENTATIONS & CERTIFICATIONS

52.0-4031	CORPORATE CERTIFICATION	. 1
52.203-2	CERTIFICATE OF INDEPENDENT PRICE DETERMINATION	
	(APR 1985)	. 2
52.203-11	CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO	
	INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991)	. 3
52.204-3	TAXPAYER IDENTIFICATION (OCT 1998)	. 3
52.204-5	WOMEN-OWNED BUSINESS (OTHER THAN SMALL BUSINESS)	
	(MAY 1999)	. 5
52.209-5	CERTIFICATION REGARDING DEBARMENT, SUSPENSION,	
	PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY	
	MATTERS (DEC 2001)	. 5
52.219-1	SMALL BUSINESS PROGRAM REPRESENTATIONS (APR 2002) -	
	ALTERNATE I (APR 2002)	. 7
52.219-2	EQUAL LOW BIDS (OCT 1995)	
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SECTION 00600 REPRESENTATIONS & CERTIFICATIONS

CLAUSES INCORPORATED BY FULL TEXT:

52.0-4031 CORPORATE CERTIFICATION

IF A BIDDER IS A CORPORATION OR IF CORPORATION IS PARTICIPATING IN A JOINT VENTURE, PLEASE COMPLETE THE FOLLOWING CERTIFICATION:

I,, certify that I am secretary of	I, _
the corporation named as Contractor herein; that	the cor
who signed this contract on behalf of the	
Contractor; was then of said	Contra
corporation; that said contract was duly signed for and on behalf of	corpor
said corporation by authority of its governing body and is within the	said co
scope of its corporate powers.	scope
(CORPORATE SEAL)	(CORI
(Secretary)	

IF A CORPORATION IS PARTICIPATING AS A JOINT VENTURE, ITS SECRETARY MUST SUBMIT A CERTIFICATE STATING THE CORPORATION IS AUTHORIZED TO PARTICIPATE.

52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)

- (a) The offeror certifies that --
- (1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to –
- (i) Those prices,
- (ii) The intention to submit an offer, or
- (iii) The methods of factors used to calculate the prices offered:
- (2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and
- (3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.
- (b) Each signature on the offer is considered to be a certification by the signatory that the signatory --
- (1) Is the person in the offeror's organization responsible for determining the prices offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; or
- (2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provison

 ______ (insert full name of

person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

- (ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and
- (iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision.
- (c) If the offeror deletes or modifies subparagraph (a)(2) of this provision, the offeror

must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of clause)

52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991)

- (a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this Certification.
- (b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,--
- (1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;
- (2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and
- (3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.
- (c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(End of provision)

52.204-3 TAXPAYER IDENTIFICATION (OCT 1998)

(a) Definitions.

"Common parent," as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Taxpayer Identification Number (TIN)," as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

- (b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the IRS. If the resulting contract is subject to the payment reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.
- (c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) Taxpayer Identification Number (TIN).
TIN:
TIN has been applied for.
TIN is not required because:
Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;
Offeror is an agency or instrumentality of a foreign government;
Offeror is an agency or instrumentality of the Federal Government.
(e) Type of organization.
Sole proprietorship;
Partnership;

(End of provision)	
TIN	
Name	
Name and TIN of common parent:	
Offeror is not owned or controlled by a common parent as defined in paragraph of this provision.	(a)
(f) Common parent.	
Other	
International organization per 26 CFR 1.6049-4;	
Foreign government;	
Government entity (Federal, State, or local);	
Corporate entity (tax-exempt);	
Corporate entity (not tax-exempt);	

52.204-5 WOMEN-OWNED BUSINESS (OTHER THAN SMALL BUSINESS) (MAY 1999)

- (a) Definition. Women-owned business concern, as used in this provision, means a concern that is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.
- (b) Representation. [Complete only if the offeror is a women-owned business concern and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of this solicitation.] The offeror represents that it () is a women-owned business concern.

(End of provision)

52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (DEC 2001)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that-

- (i) The Offeror and/or any of its Principals--
- (A) Are () are not () presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;
- (B) Have () have not (), within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and
- (C) Are () are not () presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.
- (ii) The Offeror has () has not (), within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.
- (2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

- (b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- (c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.
- (d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to

exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

52.219-1 SMALL BUSINESS PROGRAM REPRESENTATIONS (APR 2002) - ALTERNATE I (APR 2002)

- (a)(1) The North American Industry Classification System (NAICS) code for this acquisition is 237990.
- (2) The small business size standard is \$28,500,000.00.
- (3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.
- (b) Representations. (1) The offeror represents as part of its offer that it () is, () is not a small business concern.
- (2) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents, for general statistical purposes, that it () is, () is not a small disadvantaged business concern as defined in 13 CFR 124.1002.
- (3) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it () is, () is not a women-owned small business concern.
- (4) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it () is, () is not a veteran-owned small business concern.
- (5) (Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.) The offeror represents as part of its offer that it () is, () is not a service-disabled veteran-owned small business concern.
- (6) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offeror represents, as part of its offer, that-

(i) It () is, () is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and
(ii) It () is, () is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(6)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. (The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture:) Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.
(7) (Complete if offeror represented itself as disadvantaged in paragraph (b)(2) of this provision.) The offeror shall check the category in which its ownership falls:
Black American.
Hispanic American.
Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians).
Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).
Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).
Individual/concern, other than one of the preceding.
(c) Definitions. As used in this provision
Service-disabled veteran-owned small business concern
(1) Means a small business concern
(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

- (ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.
- (2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).
- "Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

Veteran-owned small business concern means a small business concern--

- (1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and
- (2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern --

- (1) That is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; or
- (2) Whose management and daily business operations are controlled by one or more women.
- (d) Notice.
- (1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.
- (2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--
- (i) Be punished by imposition of fine, imprisonment, or both;
- (ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of provision)

52.219-2 EQUAL LOW BIDS (OCT 1995)

- (a) This provision applies to small business concerns only.
- (b) The bidder's status as a labor surplus area (LSA) concern may affect entitlement to award in case of tie bids. If the bidder wishes to be considered for this priority, the bidder must identify, in the following space, the LSA in which the costs to be incurred on account of manufacturing or production (by the bidder or the first-tier subcontractors) amount to more than 50 percent of the contract price.

(c) Failure to identify the labor surplus area as specified in paragraph (b) of this provision will preclude the bidder from receiving priority consideration. If the bidder is awarded a contract as a result of receiving priority consideration under this provision and would not have otherwise received award, the bidder shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

52.219-4 NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS (JAN 1999)

- (a) Definition. HUBZone small business concern, as used in this clause, means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.
- (b) Evaluation preference. (1) Offers will be evaluated by adding a factor of 10 percent to the price of all offers, except--
- (i) Offers from HUBZone small business concerns that have not waived the evaluation preference;
- (ii) Otherwise successful offers from small business concerns;
- (iii) Otherwise successful offers of eligible products under the Trade Agreements Act when the dollar threshold for application of the Act is exceeded (see 25.402 of the Federal Acquisition Regulation (FAR)); and

- (iv) Otherwise successful offers where application of the factor would be inconsistent with a Memorandum of Understanding or other international agreement with a foreign government.
- (2) The factor of 10 percent shall be applied on a line item basis or to any group of items on which award may be made. Other evaluation factors described in the solicitation shall be applied before application of the factor.
- (3) A concern that is both a HUBZone small business concern and a small disadvantaged business concern will receive the benefit of both the HUBZone small business price evaluation preference and the small disadvantaged business price evaluation adjustment (see FAR clause 52.219-23). Each applicable price evaluation preference or adjustment shall be calculated independently against an offeror's base offer.

These individual preference amounts shall be added together to arrive at the total evaluated price for that offer.

- (c) Waiver of evaluation preference. A HUBZone small business concern may elect to waive the evaluation preference, in which case the factor will be added to its offer for evaluation purposes. The agreements in paragraph (d) of this clause do not apply if the offeror has waived the evaluation preference.
- ____ Offeror elects to waive the evaluation preference.
- (d) Agreement. A HUBZone small business concern agrees that in the performance of the contract, in the case of a contract for
- (1) Services (except construction), at least 50 percent of the cost of personnel for contract performance will be spent for employees of the concern or employees of other HUBZone small business concerns;
- (2) Supplies (other than procurement from a nonmanufacturer of such supplies), at least 50 percent of the cost of manufacturing, excluding the cost of materials, will be performed by the concern or other HUBZone small business concerns;
- (3) General construction, at least 15 percent of the cost of the contract performance incurred for personnel will be will be spent on the concern's employees or the employees of other HUBZone small business concerns; or
- (4) Construction by special trade contractors, at least 25 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns.
- (e) A HUBZone joint venture agrees that in the performance of the contract, the applicable percentage specified in paragraph (d) of this clause will be performed by the HUBZone small business participant or participants.

(f) A HUBZone small business concern nonmanufacturer agrees to furnish in performing this contract only end items manufactured or produced by HUBZone small business manufacturer concerns. This paragraph does not apply in connection with construction or service contracts.

(End of clause)

52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (OCT 2000)

(a) Definition.

"Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the North American Industry Classification System (NAICS) code assigned to a contracting opportunity.

- (b) [Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.] The Offeror [] is, [] is not an emerging small business.
- (c) (Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)

Offeror's number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror's average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts). (Check one of the following.)

No. of Employees Avg. Annual Gross Revenues

50 or fewer	\$1 million or less
51 - 100	\$1,000,001 - \$2 million
101 - 250	\$2,000,001 - \$3.5 million
251 - 500	\$3,500,001 - \$5 million
501 - 750	\$5,000,001 - \$10 million
751 - 1,000	\$10,000,001 - \$17 million

Over 1,000	Over \$17 million
	(End of provision)

52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FEB 1999)

The offeror represents that --(a) () It has, () has not participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation; (b) () It has, () has not, filed all required compliance reports; and (c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)

52.223-13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)

- (a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.
- (b) By signing this offer, the offeror certifies that--
- (1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42) U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or
- (2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Check each block that is applicable.)
- () (i) The facility does not manufacture, process or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);
- () (ii) The facility does not have 10 or more full-time employees as specified in section 313.(b)(1)(A) of EPCRA 42 U.S.C. 11023(b)(1)(A);

- () (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);
- () (iv) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or
- () (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) "Definitions."

As used in this provision --

- (1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.
- (2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for such acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.
- (3) "Significant interest" means --
- (i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;
- (ii) Holding a management position in the firm, such as a director or officer;
- (iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;
- (iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings,

real estate, or other tangible assets of the firm; or

- (v) Holding 50 percent or more of the indebtedness of a firm.
- (b) "Prohibition on award."

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) "Disclosure."

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclosure such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include --

- (1) Identification of each government holding a significant interest; and
- (2) A description of the significant interest held by each government.

(End of provision)

252.225-7017 PROHIBITION ON AWARD TO COMPANIES OWNED BY THE PEOPLE'S REPUBLIC OF CHINA (FEB 2000)

- (a) Definition. "People's Republic of China," as used in this provision, means the government of the People's Republic of China, including its political subdivisions, agencies, and instrumentalities.
- (b) Prohibition on award. Section 8120 of the Department of Defense Appropriations Act for fiscal year 1999 (Pub. L. 105-262), as amended by Section 144 of Title I, Division C, of the Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999 (Pub. L. 105-277), prohibits the award of a contract under this solicitation to any company in which the Director of Defense Procurement (Office of the Under Secretary of Defense (Acquisition, Technology, and Logistics)) has determined that the People's Republic of China or the People's Liberation Army of the People's Republic of China owns more than 50 percent interest.
- (c) Representation. By submission of an offer, the offeror represents that the People's Republic of China or the People's Liberation Army of the People's Republic of China does not own more than 50 percent interest in the offeror.

(End of provision)

252.225-7035 BUY AMERICAN ACT—NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT—BALANCE OF PAYMENTS PROGRAM CERTIFICATE (MAR 1998)—ALTERNATE I (MAR 1998)

- (a) Definitions. "Domestic end product," "foreign end product," "Canadian end product," and "qualifying country end product" have the meanings given in the Buy American Act-North American Free Trade Agreement Implementation Act--Balance of Payments Program clause of this solicitation.
- (b) Evaluation. Offers will be evaluated in accordance with the policies and procedures of Part 225 of the Defense Federal Acquisition Regulation Supplement. For line items subject to the North American Free Trade Agreement Implementation Act, offers of qualifying country end products or Canadian end products will be evaluated without regard to the restrictions of the Buy American Act or the Balance of Payments Program.
- (c) Certifications. (1) The offeror certifies that--
- (i) Each end product, except the end products listed in paragraph (c)(2) of this provision, is a domestic end product; and
- (ii) Components of unknown origin are considered to have been mined, produced, or manufactured outside the United States or a qualifying country.
- (2) The Offeror must identify all end products that are not domestic end products.
- (i) The Offeror certifies that the following supplies are qualifying country (except Canada) end products:

insert line item number insert country of origin

(ii) The Offeror certifies that the following supplies qualify as Canadian end products:

insert line item number insert country of origin

(iii) The following supplies are other foreign end products:			
insert line item number insert country of origin			
(End of clause)			
252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)			
(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term supplies is defined in the Transportation of Supplies by Sea clause of this solicitation.			
(b) Representation. The Offeror represents that it:			
(1) Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.			
(2) Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.			
(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.			

(End of provision)

END OF SECTION 00600

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SECTION 00700 CONTRACT CLAUSES

CLAUSES INCORPORATED BY FULL TEXT:

52.202-1 DEFINITIONS (MAY 2001) --ALTERNATE I (MAR 2001)

- (a) Agency head or head of the agency means the Secretary (Attorney General, Administrator, Governor, Chairperson, or other chief official, as appropriate) of the agency, unless otherwise indicated, including any deputy or assistant chief official of the executive agency.
- (b) Commercial component means any component that is a commercial item.
- (c) Component means any item supplied to the Government as part of an end item or of another component, except that for use in 52.225-9, and 52.225-11 see the definitions in 52.225-9(a) and 52.225-11(a).
- (d) Contracting Officer means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.
- (e) Nondevelopmental item means--
- (1) Any previously developed item of supply used exclusively for governmental purposes by a Federal agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;
- (2) Any item described in paragraph (f)(1) of this definition that requires only minor modification or modifications of a type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency; or
- (3) Any item of supply being produced that does not meet the requirements of paragraph (f)(1) or (f)(2) solely because the item is not yet in use.
- (f) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.
- (g) Except as otherwise provided in this contract, the term "subcontracts" includes, but is not limited to, purchase orders and changes and modifications to purchase orders under this contract.

52.203-3 GRATUITIES (APR 1984)

- (a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--
- (1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and
- (2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.
- (b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.
- (c) If this contract is terminated under paragraph (a) of this clause, the Government is entitled-
- (1) To pursue the same remedies as in a breach of the contract; and
- (2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)
- (d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.203-5 COVENANT AGAINST CONTINGENT FEES (APR 1984)

- (a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.
- (b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

(End of clause)

52.203-7 ANTI-KICKBACK PROCEDURES. (JUL 1995)

(a) Definitions.

"Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

"Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment, or services of any kind.

"Prime Contractor," as used in this clause, means a person who has entered into a prime contract with the United States.

"Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

"Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

"Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind

under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

"Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

- (b) The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from -
- (1) Providing or attempting to provide or offering to provide any kickback;
- (2) Soliciting, accepting, or attempting to accept any kickback; or
- (3) Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.
- (c)(1) The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph (b) of this clause in its own operations and direct business relationships.
- (2) When the Contractor has reasonable grounds to believe that a violation described in paragraph (b) of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.
- (3) The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph (b) of this clause.
- (4) The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold, from sums owed a subcontractor under the prime contract, the amount of any kickback. The Contracting Officer may order the monies withheld under subdivision (c)(4)(ii) of this clause be paid over to the Government unless the Government has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.
- (5) The Contractor agrees to incorporate the substance of this clause, including this subparagraph (c)(5) but excepting subparagraph (c)(1), in all subcontracts under this contract which exceed \$100,000.

52.203-8 CANCELLATION, RESCISSION, AND RECOVERY OF FUNDS FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

- (a) If the Government receives information that a contractor or a person has engaged in conduct constituting a violation of subsection (a), (b), (c), or (d) of Section 27 of the Office of Federal Procurement Policy Act (41 U.S.C. 423) (the Act), as amended by section 4304 of the 1996 National Defense Authorization Act for Fiscal Year 1996 (Pub. L. 104-106), the Government may--
- (1) Cancel the solicitation, if the contract has not yet been awarded or issued; or
- (2) Rescind the contract with respect to which--
- (i) The Contractor or someone acting for the Contractor has been convicted for an offense where the conduct constitutes a violation of subsection 27(a) or (b) of the Act for the purpose of either--
- (A) Exchanging the information covered by such subsections for anything of value; or
- (B) Obtaining or giving anyone a competitive advantage in the award of a Federal agency procurement contract; or
- (ii) The head of the contracting activity has determined, based upon a preponderance of the evidence, that the Contractor or someone acting for the Contractor has engaged in conduct constituting an offense punishable under subsections 27(e)(1) of the Act.
- (b) If the Government rescinds the contract under paragraph (a) of this clause, the Government is entitled to recover, in addition to any penalty prescribed by law, the amount expended under the contract.
- (c) The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law, regulation, or under this contract.

52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

- (a) The Government, at its election, may reduce the price of a fixed-price type contract and the total cost and fee under a cost-type contract by the amount of profit or fee determined as set forth in paragraph (b) of this clause if the head of the contracting activity or designee determines that there was a violation of subsection 27 (a), (b), or (c) of the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 423), as implemented in section 3.104 of the Federal Acquisition Regulation.
- (b) The price or fee reduction referred to in paragraph (a) of this clause shall be--
- (1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

- (2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award, notwithstanding any minimum fee or "fee floor" specified in the contract;
- (3) For cost-plus-award-fee contracts--
- (i) The base fee established in the contract at the time of contract award;
- (ii) If no base fee is specified in the contract, 30 percent of the amount of each award fee otherwise payable to the Contractor for each award fee evaluation period or at each award fee determination point.
- (4) For fixed-price-incentive contracts, the Government may--
- (i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award; or
- (ii) If an immediate adjustment to the contract target price and contract target profit would have a significant adverse impact on the incentive price revision relationship under the contract, or adversely affect the contract financing provisions, the Contracting Officer may defer such adjustment until establishment of the total final price of the contract. The total final price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price.
- (5) For firm-fixed-price contracts, by 10 percent of the initial contract price or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award.
- (c) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraph (b) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.
- (d) In addition to the remedies in paragraphs (a) and (c) of this clause, the Government may terminate this contract for default. The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law or under this contract.

52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 1997)

(a) Definitions.

"Agency," as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

- (1) The awarding of any Federal contract.
- (2) The making of any Federal grant.
- (3) The making of any Federal loan.
- (4) The entering into of any cooperative agreement.
- (5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization," as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

- (1) An individual who is appointed to a position in the Government under Title 5, United States Code, including a position under a temporary appointment.
- (2) A member of the uniformed services, as defined in subsection 101(3), Title 37, United States Code.
- (3) A special Government employee, as defined in section 202, Title 18, United States Code.
- (4) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, Title 5, United States Code, appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit, or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation," as used in this clause, means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment," as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient," as used in this clause, includes the Contractor and all subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed," as used in this clause, means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

"State," as used in this clause, means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) Prohibitions.

(1) Section 1352 of Title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

- (2) The Act also requires Contractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.
- (3) The prohibitions of the Act do not apply under the following conditions:
- (i) Agency and legislative liaison by own employees.
- (A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.
- (B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.
- (C) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:
- (1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person's products or services, conditions or terms of sale, and service capabilities.
- (2) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.
- (D) The following agency and legislative liaison activities are permitted where they are prior to formal solicitation of any covered Federal action--
- (1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action:
- (2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and
- (3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub. L. 95-507, and subsequent amendments.
- (E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.
- (ii) Professional and technical services.

- (A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of--
- (1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.
- (2) Any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.
- (B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.
- (C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.
- (D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

- (E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.
- (c) Disclosure.
- (1) The Contractor who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (b)(1) of this clause, if paid for with appropriated funds.
- (2) The Contractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes--
- (i) A cumulative increase of \$25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or
- (ii) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or
- (iii) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.
- (3) The Contractor shall require the submittal of a certification, and if required, a disclosure form by any person who requests or receives any subcontract exceeding \$100,000 under the Federal contract.
- (4) All subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Contractor. The prime Contractor shall submit all disclosures to the Contracting Officer at the end of the calendar quarter in which the disclosure form is submitted by the subcontractor. Each subcontractor certification shall be retained in the subcontract file of the awarding Contractor.
- (d) Agreement. The Contractor agrees not to make any payment prohibited by this clause.
- (e) Penalties.
- (1) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided for by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

- (2) Contractors may rely without liability on the representation made by their subcontractors in the certification and disclosure form.
- (f) Cost allowability. Nothing in this clause makes allowable or reasonable any costs which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

52.204-4 PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (AUG 2000)

- (a) Definitions. As used in this clause--
- "Postconsumer material" means a material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. Postconsumer material is a part of the broader category of "recovered material." For paper and paper products, postconsumer material means "postconsumer fiber" defined by the U.S. Environmental Protection Agency (EPA) as--
- (1) Paper, paperboard, and fibrous materials from retail stores, office buildings, homes, and so forth, after they have passed through their end-usage as a consumer item, including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards; and used cordage; or
- (2) All paper, paperboard, and fibrous materials that enter and are collected from municipal solid waste; but not
- (3) Fiber derived from printers' over-runs, converters' scrap, and over-issue publications.
- "Printed or copied double-sided" means printing or reproducing a document so that information is on both sides of a sheet of paper.
- "Recovered material," for paper and paper products, is defined by EPA in its Comprehensive Procurement Guideline as "recovered fiber" and means the following materials:
- (1) Postconsumer fiber; and
- (2) Manufacturing wastes such as--
- (i) Dry paper and paperboard waste generated after completion of the papermaking process (that is, those manufacturing operations up to and including the cutting and trimming of the paper machine reel into smaller rolls or rough sheets) including: envelope cuttings, bindery trimmings, and other paper and paperboard waste resulting from printing, cutting, forming, and other

converting operations; bag, box, and carton manufacturing wastes; and butt rolls, mill wrappers, and rejected unused stock; and

- (ii) Repulped finished paper and paperboard from obsolete inventories of paper and paperboard manufacturers, merchants, wholesalers, dealers, printers, converters, or others.
- (b) In accordance with Section 101 of Executive Order 13101 of September 14, 1998, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition, the Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed or copied double-sided on recycled paper that meet minimum content standards specified in Section 505 of Executive Order 13101, when not using electronic commerce methods to submit information or data to the Government.
- (c) If the Contractor cannot purchase high-speed copier paper, offset paper, forms bond, computer printout paper, carbonless paper, file folders, white wove envelopes, writing and office paper, book paper, cotton fiber paper, and cover stock meeting the 30 percent postconsumer material standard for use in submitting paper documents to the Government, it should use paper containing no less than 20 percent postconsumer material. This lesser standard should be used only when paper meeting the 30 percent postconsumer material standard is not obtainable at a reasonable price or does not meet reasonable performance standards.

(End of clause)

52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUL 1995)

- (a) The Government suspends or debars Contractors to protect the Government's interests. The Contractor shall not enter into any subcontract in excess of the \$25,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.
- (b) The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed \$25,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principles, is or is not debarred, suspended, or proposed for debarment by the Federal Government.
- (c) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs). The notice must include the following:
- (1) The name of the subcontractor.
- (2) The Contractor's knowledge of the reasons for the subcontractor being on the List of Parties

Excluded from Federal Procurement and Nonprocurement Programs.

- (3) The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.
- (4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(End of clause)

52.211-18 VARIATION IN ESTIMATED QUANTITY (APR 1984)

If the quantity of a unit-priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more than 15 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request, in writing, an extension of time, to be received by the Contracting Officer within 10 days from the beginning of the delay, or within such further period as may be granted by the Contracting Officer before the date of final settlement of the contract. Upon the receipt of a written request for an extension, the Contracting Officer shall ascertain the facts and make an adjustment for extending the completion date as, in the judgement of the Contracting Officer, is justified.

52.214-26 AUDIT AND RECORDS--SEALED BIDDING (OCT 1997)

- (a) As used in this clause, records includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.
- (b) Cost or pricing data. If the Contractor has been required to submit cost or pricing data in connection with the pricing of any modification to this contract, the Contracting Officer, or an authorized representative of the Contracting Officer, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data, shall have the right to examine and audit all of the Contractor's records, including computations and projections, related to--
- (1) The proposal for the modification;
- (2) The discussions conducted on the proposal(s), including those related to negotiating;
- (3) Pricing of the modification; or

- (4) Performance of the modification.
- (c) Comptroller General. In the case of pricing any modification, the Comptroller General of the United States, or an authorized representative, shall have the same rights as specified in paragraph (b) of this clause.
- (d) Availability. The Contractor shall make available at its office at all reasonable times the materials described in reproduction, until 3 years after final payment under this contract, or for any other period specified in Subpart 4.7 of the Federal Acquisition Regulation (FAR). FAR Subpart 4.7, Contractor Records Retention, in effect on the data of this contract, is incorporated by reference in its entirety and made a part of this contract.
- (1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement.
- (2) Records pertaining to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the performance of this contract shall be made available until disposition of such appeals, litigation, or claims.
- (e) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (e), in all subcontracts expected to exceed the threshold in FAR 15.403-4(a)(1) for submission of cost or pricing data.

52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING (OCT 1997)

- (a) This clause shall become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for the submission of cost or pricing data at FAR 15.403-4(a)(1), except that this clause does not apply to a modification if an exception under FAR 15.403-1(b) applies.
- (1) Based on adequate price competition;
- (2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or
- (3) Set by law or regulation.
- (b) If any price, including profit, negotiated in connection with any modification under this clause, was increased by any significant amount because

- (1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data;
- (2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data; or
- (3) any of these parties furnished data of any description that were not accurate, the price shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.
- (c) Any reduction in the contract price under paragraph (b) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which:
- (1) the actual subcontract; or
- (2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.
- (d) If the Contracting Officer determines under paragraph (b) of this clause that a price or cost reduction should be made:
- (1) the Contractor agrees not to raise the following matters as a defense:
- (i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted;
- (ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer;
- (iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract; or
- (iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.
- (2) Except as prohibited by subdivision (d)(2)(ii) of this clause:
- (i) an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if:

- (A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and
- (B) The Contractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.
- (ii) An offset shall not be allowed if:
- (A) The understated data was known by the Contractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or (B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data had been submitted before the date of agreement on price.
- (e) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid:
- (1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of the Treasury under 26 U.S.C. 6621(a)(2); and
- (2) A penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data which were incomplete, inaccurate, or noncurrent.

52.214-28 SUBCONTRACTOR COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING (OCT 1997)

- (a) The requirements of paragraphs (b) and (c) of this clause shall:
- (1) become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at (FAR) 48 CFR 15.403-4(a)(1); and
- (2) be limited to such modifications.
- (b) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modifications involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for

submission of cost or pricing data at FAR 15.403-4(a)(1), the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless an exception under FAR 15.403-1(b) applies.

- (1) Based on adequate price competition;
- (2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or
- (3) Set by law or regulation.
- (c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection 15.406-2 of the Federal Acquisition Regulation that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.
- (d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that, when entered into, exceeds the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1).

(End of clause)

52.214-29 ORDER OF PRECEDENCE--SEALED BIDDING (JAN 1986)

Any inconsistency in this solicitation or contract shall be resolved by giving precedence in the following order: (a) the Schedule (excluding the specifications); (b) representations and other instructions; (c) contract clauses; (d) other documents, exhibits, and attachments; and (e) the specifications.

(End of clause)

52.217-7 OPTION FOR INCREASED QUANTITY--SEPARATELY PRICED LINE ITEM (MAR 1989)

The Government may require the delivery of the numbered line item, identified in the Schedule as an option item, in the quantity and at the price stated in the Schedule. The Contracting Officer may exercise the option by written notice to the Contractor within 180 days after award for Option #1 and within 90 days after award for Option #2. Delivery of added items shall continue at the same rate that like items are called for under the contract, unless the parties otherwise agree.

(End of clause)

52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS (OCT 2000)

- (a) It is the policy of the United States that small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency, including contracts and subcontracts for subsystems, assemblies, components, and related services for major systems. It is further the policy of the United States that its prime contractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their subcontracts with small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns.
- (b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

Definitions. As used in this contract--

HUBZone small business concern means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

Service-disabled veteran-owned small business concern--

- (1) Means a small business concern--
- (i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and
- (ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.
- (2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

Small business concern means a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.

Small disadvantaged business concern means a small business concern that represents, as part of its offer that--

- (1) It has received certification as a small disadvantaged business concern consistent with 13 CFR part 124, subpart B;
- (2) No material change in disadvantaged ownership and control has occurred since its certification:
- (3) Where the concern is owned by one or more individuals, the net worth of each individual upon whom the certification is based does not exceed \$750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and
- (4) It is identified, on the date of its representation, as a certified small disadvantaged business in the database maintained by the Small Business Administration (PRO-Net).

Veteran-owned small business concern means a small business concern-

- (1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and
- (2) The management and daily business operations of which are controlled by one or more veterans.

Women-owned small business concern means a small business concern-

- (1) That is at least 51 percent owned by one or more women, or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and
- (2) Whose management and daily business operations are controlled by one or more women.
- (d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern, a veteran-owned small business concern, a service-disabled veteran-owned small business concern, a HUBZone small business concern, a small disadvantaged business concern, or a women-owned small business concern.

(End of clause)

52.219-9 SMALL BUSINESS SUBCONTRACTING PLAN (JAN 2002)--ALTERNATE I (OCT 2001)

(a) This clause does not apply to small business concerns.

(b) Definitions. As used in this clause--

Commercial item means a product or service that satisfies the definition of commercial item in section 2.101 of the Federal Acquisition Regulation.

Commercial plan means a subcontracting plan (including goals) that covers the offeror's fiscal year and that applies to the entire production of commercial items sold by either the entire company or a portion thereof (e.g., division, plant, or product line).

Individual contract plan means a subcontracting plan that covers the entire contract period (including option periods), applies to a specific contract, and has goals that are based on the offeror's planned subcontracting in support of the specific contract, except that indirect costs incurred for common or joint purposes may be allocated on a prorated basis to the contract.

Master plan means a subcontracting plan that contains all the required elements of an individual contract plan, except goals, and may be incorporated into individual contract plans, provided the master plan has been approved.

Subcontract means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

- (c) The apparent low bidder, upon request by the Contracting Officer, shall submit a subcontracting plan, where applicable, that separately addresses subcontracting with small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns. If the bidder is submitting an individual contract plan, the plan must separately address subcontracting with small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns, with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for the award of a contract.
- (d) The offeror's subcontracting plan shall include the following:
- (1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business, veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.
- (2) A statement of--

- (i) Total dollars planned to be subcontracted for an individual contract plan; or the offeror's total projected sales, expressed in dollars, and the total value of projected subcontracts to support the sales for a commercial plan;
- (ii) Total dollars planned to be subcontracted to small business concerns;
- (iii) Total dollars planned to be subcontracted to veteran-owned small business concerns;
- (iv) Total dollars planned to be subcontracted to HUBZone small business concerns;
- (v) Total dollars planned to be subcontracted to small disadvantaged business concerns; and
- (vi) Total dollars planned to be subcontracted to women-owned small business concerns.
- (3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to--
- (i) Small business concerns;
- (ii) Veteran-owned small business concerns;
- (iii) HUBZone small business concerns;
- (iv) Small disadvantaged business concerns; and
- (v) Women-owned small business concerns.
- (4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.
- (5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Marketing and Access Network (PRO-Net) of the Small Business Administration (SBA), veterans service organizations, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, HUBZone, small disadvantaged, and women-owned small business trade associations). A firm may rely on the information contained in PRO-Net as an accurate representation of a concern's size and ownership characteristics for the purposes of maintaining a small, veteran-owned small, HUBZone small, small disadvantaged, and women-owned small business source list. Use of PRO-Net as its source list does not relieve a firm of its responsibilities (e.g., outreach, assistance, counseling, or publicizing subcontracting opportunities) in this clause.
- (6) A statement as to whether or not the offeror in included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with—

- (i) Small business concerns;
- (ii) Veteran-owned small business concerns;
- (iii) HUBZone small business concerns;
- (iv) Small disadvantaged business concerns; and
- (v) Women-owned small business concerns.
- (7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.
- (8) A description of the efforts the offeror will make to assure that small business, veteran-owned small business, HUBZone small business, small disadvantaged business and women-owned small business concerns have an equitable opportunity to compete for subcontracts.
- (9) Assurances that the offeror will include the clause of this contract entitled "Utilization of Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) that receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) to adopt a subcontracting plan that complies with the requirements of this clause.
- (10) Assurances that the offeror will--
- (i) Cooperate in any studies or surveys as may be required;
- (ii) Submit periodic reports so that the Government can determine the extent of compliance by the offeror with the subcontracting plan;
- (iii) Submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with paragraph (j) of this clause. The reports shall provide information on subcontract awards to small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, small disadvantaged business concerns, women-owned small business concerns, and Historically Black Colleges and Universities and Minority Institutions. Reporting shall be in accordance with the instructions on the forms or as provided in agency regulations.
- (iv) Ensure that its subcontractors agree to submit SF 294 and SF 295.
- (11) A description of the types of records that will be maintained concerning procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of the offeror's efforts to locate small business, veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned

small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated)

- (i) Source lists (e.g., PRO-Net), guides, and other data that identify small business, veteranowner small business, HUBZone small business, small disadvantaged business, and womenowned small business concerns.
- (ii) Organizations contacted in an attempt to locate sources that are small business, veteranowned small business, HUBZone small business, small disadvantaged business, or womenowned small business concerns.
- (iii) Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating--
- (A) Whether small business concerns were solicited and, if not, why not;
- (B) Whether veteran-owned small business concerns were solicited and, if not, why not;
- (C) Whether HUBZone small business concerns were solicited and, if not, why not;
- (D) Whether small disadvantaged business concerns were solicited and, if not, why not;
- (E) Whether women-owned small business concerns were solicited and, if not, why not; and
- (F) If applicable, the reason award was not made to a small business concern.
- (iv) Records of any outreach efforts to contact--
- (A) Trade associations;
- (B) Business development organizations;
- (C) Conferences and trade fairs to locate small, HUBZone small, small disadvantaged, and women-owned small business sources; and
- (D) Veterans service organizations.
- (v) Records of internal guidance and encouragement provided to buyers through-
- (A) Workshops, seminars, training, etc.; and
- (B) Monitoring performance to evaluate compliance with the program's requirements.

- (vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having commercial plans need not comply with this requirement.
- (e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:
- (1) Assist small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.
- (2) Provide adequate and timely consideration of the potentialities of small business, veteranowner small business, HUBZone small business, small disadvantaged business, and womenowned small business concerns in all ``make-or-buy" decisions.
- (3) Counsel and discuss subcontracting opportunities with representatives of small business, veteran-owner small business, HUBZone small business, small disadvantaged business, and women-owned small business firms.
- (4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, veteran-owner small business, HUBZone small, small disadvantaged, or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.
- (f) A master plan on a plant or division-wide basis that contains all the elements required by paragraph (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided--
- (1) the master plan has been approved, (2) the offeror ensures that the master plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.
- (g) A commercial plan is the preferred type of subcontracting plan for contractors furnishing commercial items. The commercial plan shall relate to the offeror's planned subcontracting generally, for both commercial and Government business, rather than solely to the Government contract. Commercial plans are also preferred for subcontractors that provide commercial items under a prime contract, whether or not the prime contractor is supplying a commercial item.

- (h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.
- (i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization Of Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.
- (j) The Contractor shall submit the following reports:
- (1) Standard Form 294, Subcontracting Report for Individual Contracts. This report shall be submitted to the Contracting Officer semiannually and at contract completion. The report covers subcontract award data related to this contract. This report is not required for commercial plans.
- (2) Standard Form 295, Summary Subcontract Report. This report encompasses all of the contracts with the awarding agency. It must be submitted semi-annually for contracts with the Department of Defense and annually for contracts with civilian agencies. If the reporting activity is covered by a commercial plan, the reporting activity must report annually all subcontract awards under that plan. All reports submitted at the close of each fiscal year (both individual and commercial plans) shall include a breakout, in the Contractor's format, of subcontract awards, in whole dollars, to small disadvantaged business concerns by North American Industry Classification System (NAICS) Industry Subsector. For a commercial plan, the Contractor may obtain from each of its subcontractors a predominant NAICS Industry Subsector and report all awards to that subcontractor under its predominant NAICS Industry Subsector.

52.219-16 LIQUIDATED DAMAGES-SUBCONTRACTING PLAN (JAN 1999)

- (a) Failure to make a good faith effort to comply with the subcontracting plan, as used in this clause, means a willful or intentional failure to perform in accordance with the requirements of the subcontracting plan approved under the clause in this contract entitled "Small Business Subcontracting Plan," or willful or intentional action to frustrate the plan.
- (b) Performance shall be measured by applying the percentage goals to the total actual subcontracting dollars or, if a commercial plan is involved, to the pro rata share of actual subcontracting dollars attributable to Government contracts covered by the commercial plan. If, at contract completion or, in the case of a commercial plan, at the close of the fiscal year for which the plan is applicable, the Contractor has failed to meet its subcontracting goals and the Contracting Officer decides in accordance with paragraph (c) of this clause that the Contractor failed to make a good faith effort to comply with its subcontracting plan, established in accordance with the clause in this contract entitled "Small Business Subcontracting Plan," the Contractor shall pay the Government liquidated damages in an amount stated. The amount of

probable damages attributable to the Contractor's failure to comply shall be an amount equal to the actual dollar amount by which the Contractor failed to achieve each subcontract goal.

- (c) Before the Contracting Officer makes a final decision that the Contractor has failed to make such good faith effort, the Contracting Officer shall give the Contractor written notice specifying the failure and permitting the Contractor to demonstrate what good faith efforts have been made and to discuss the matter. Failure to respond to the notice may be taken as an admission that no valid explanation exists. If, after consideration of all the pertinent data, the Contracting Officer finds that the Contractor failed to make a good faith effort to comply with the subcontracting plan, the Contracting Officer shall issue a final decision to that effect and require that the Contractor pay the Government liquidated damages as provided in paragraph (b) of this clause.
- (d) With respect to commercial plans, the Contracting Officer who approved the plan will perform the functions of the Contracting Officer under this clause on behalf of all agencies with contracts covered by the commercial plan.
- (e) The Contractor shall have the right of appeal, under the clause in this contract entitled Disputes, from any final decision of the Contracting Officer.
- (f) Liquidated damages shall be in addition to any other remedies that the Government may have.

(End of clause)

52.222-1 NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)

If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

(End of clause)

52.222-3 CONVICT LABOR (AUG 1996)

The Contractor agrees not to employ in the performance of this contract any person undergoing a sentence of imprisonment which has been imposed by any court of a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands. This limitation, however, shall not prohibit the employment by the Contractor in the performance of this contract of persons on parole or probation to work at paid employment during the term of their sentence or persons who have been pardoned or who have served their terms. Nor shall it prohibit the employment by the Contractor in the performance of this contract of persons confined for violation of the laws of any of the States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth

of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands who are authorized to work at paid employment in the community under the laws of such jurisdiction, if--

- (a)(1) The worker is paid or is in an approved work training program on a voluntary basis;
- (2) Representatives of local union central bodies or similar labor union organizations have been consulted;
- (3) Such paid employment will not result in the displacement of employed workers, or be applied in skills, crafts, or trades in which there is a surplus of available gainful labor in the locality, or impair existing contracts for services; and
- (4) The rates of pay and other conditions of employment will not be less than those paid or provided for work of a similar nature in the locality in which the work is being performed; and
- (b) The Attorney General of the United States has certified that the work-release laws or regulations of the jurisdiction involved are in conformity with the requirements of Executive Order 11755, as amended by Executive Orders 12608 and 12943.

(End of clause)

52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION (SEP 2000)

- (a) Overtime requirements. No Contractor or subcontractor employing laborers or mechanics (see Federal Acquisition Regulation 22.300) shall require or permit them to work over 40 hours in any workweek unless they are paid at least 1 and 1/2 times the basic rate of pay for each hour worked over 40 hours.
- (b) Violation; liability for unpaid wages; liquidated damages. The responsible Contractor and subcontractor are liable for unpaid wages if they violate the terms in paragraph (a) of this clause. In addition, the Contractor and subcontractor are liable for liquidated damages payable to the Government. The Contracting Officer will assess liquidated damages at the rate of \$10 per affected employee for each calendar day on which the employer required or permitted the employee to work in excess of the standard workweek of 40 hours without paying overtime wages required by the Contract Work Hours and Safety Standards Act.
- (c) Withholding for unpaid wages and liquidated damages. The Contracting Officer will withhold from payments due under the contract sufficient funds required to satisfy any Contractor or subcontractor liabilities for unpaid wages and liquidated damages. If amounts withheld under the contract are insufficient to satisfy Contractor or subcontractor liabilities, the Contracting Officer will withhold payments from other Federal or Federally assisted contracts held by the same Contractor that are subject to the Contract Work Hours and Safety Standards Act.

- (d) Payrolls and basic records.
- (1) The Contractor and its subcontractors shall maintain payrolls and basic payroll records for all laborers and mechanics working on the contract during the contract and shall make them available to the Government until 3 years after contract completion. The records shall contain the name and address of each employee, social security number, labor classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records need not duplicate those required for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.
- (2) The Contractor and its subcontractors shall allow authorized representatives of the Contracting Officer or the Department of Labor to inspect, copy, or transcribe records maintained under paragraph (d)(1) of this clause. The Contractor or subcontractor also shall allow authorized representatives of the Contracting Officer or Department of Labor to interview employees in the workplace during working hours.
- (e) Subcontracts. The Contractor shall insert the provisions set forth in paragraphs (a) through (d) of this clause in subcontracts exceeding \$100,000 and require subcontractors to include these provisions in any lower tier subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower-tier subcontractor with the provisions set forth in paragraphs (a) through (d) of this clause.

52.222-6 DAVIS-BACON ACT (FEB 1995)

(a) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be

compensated at the rate specified for each classification for the time actually worked therein; provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- (b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met:
- (i) The work to be performed by the classification requested is not performed by a classification in the wage determination.
- (ii) The classification is utilized in the area by the construction industry.
- (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.
- (3) In the event the Contractor, the laborers or mechanics to be employed in the classification, or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.
- (4) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (b)(2) and (b)(3) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

- (c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- (c) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

52.222-7 WITHHOLDING OF FUNDS (FEB 1988)

The Contracting Officer shall, upon his or her own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(End of clause)

52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (d) of the clause entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in

providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

- (b)(1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.
- (2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify--
- (i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause and that such information is correct and complete;
- (ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3; and
- (iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (b)(2) of this clause.
- (4) The falsification of any of the certifications in this clause may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.
- (c) The Contractor or subcontractor shall make the records required under paragraph (a) of this

clause available for inspection, copying, or transcription by the Contracting Officer or authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit the Contracting Officer or representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(End of clause)

52.222-9 APPRENTICES AND TRAINEES (FEB 1988)

(a) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (b) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- (c) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

52.222-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)

The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(End of clause)

52.222-11 SUBCONTRACTS (LABOR STANDARDS (FEB 1988)

(a) The Contractor or subcontractor shall insert in any subcontracts the clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act-Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Withholding of Funds, Subcontracts (Labor Standards), Contract Termination-

Debarment, Disputes Concerning Labor Standards, Compliance with Davis-Bacon and Related Act Regulations, and Certification of Eligibility, and such other clauses as the Contracting Officer may, by appropriate instructions, require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited in this paragraph.

- (b)(1) Within 14 days after award of the contract, the Contractor shall deliver to the Contracting Officer a completed Statement and Acknowledgment Form (SF 1413) for each subcontract, including the subcontractor's signed and dated acknowledgment that the clauses set forth in paragraph (a) of this clause have been included in the subcontract.
- (2) Within 14 days after the award of any subsequently awarded subcontract the Contractor shall deliver to the Contracting Officer an updated completed SF 1413 for such additional subcontract.

(End of clause)

52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)

A breach of the contract clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Subcontracts (Labor Standards), Compliance with Davis-Bacon and Related Act Regulations, or Certification of Eligibility may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 CFR 5.12.

(End of clause)

52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in this contract.

(End of clause)

52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)

The United States Department of Labor has set forth in 29 CFR Parts 5, 6, and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contract. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors)

and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(End of clause)

52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)

- (a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(End of clause)

52.222-21 PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)

- (a) Segregated facilities, as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.
- (b) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.
- (c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

(End of clause)

52.222-26 EQUAL OPPORTUNITY (APR 2002)

- (a) Definition. United States, as used in this clause, means the 50 States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, the U.S. Virgin Islands, and Wake Island.
- (b) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of \$10,000, the Contractor shall comply with paragraphs (b)(1) through (b)(11) of this clause, except for work performed outside the United States by employees who were not recruited within the United States. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.
- (1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. However, it shall not be a violation of this clause for the Contractor to extend a publicly announced preference in employment to Indians living on or near an Indian reservation, in connection with employment opportunities on or near an Indian reservation, as permitted by 41 CFR 60-1.5.
- (2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.
- (3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.
- (4) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- (5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
- (6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
- (7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. The

Contractor shall also file Standard Form 100 (EEO-1), or any successor form, as prescribed in 41 CFR part 60-1. Unless the Contractor has filed within the 12 months preceding the date of contract award, the Contractor shall, within 30 days after contract award, apply to either the regional Office of Federal Contract Compliance Programs (OFCCP) or the local office of the Equal Employment Opportunity Commission for the necessary forms.

- (8) The Contractor shall permit access to its premises, during normal business hours, by the contracting agency or the OFCCP for the purpose of conducting on-site compliance evaluations and complaint investigations. The Contractor shall permit the Government to inspect and copy any books, accounts, records (including computerized records), and other material that may be relevant to the matter under investigation and pertinent to compliance with Executive Order 11246, as amended, and rules and regulations that implement the Executive Order.
- (9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended; in the rules, regulations, and orders of the Secretary of Labor; or as otherwise provided by law.
- (10) The Contractor shall include the terms and conditions of subparagraphs (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.
- (11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting officer may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.
- (c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

(End of clause)

52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (FEB 1999)

(a) Definitions. "Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Deputy Assistant Secretary," as used in this clause, means Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, or a designee.

"Employer's identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

"Minority," as used in this clause, means--

- (1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
- (2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);
- (3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin); and
- (4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race).
- (b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of \$10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.
- (c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.
- (d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

- (e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.
- (f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
- (g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:
- (1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.
- (2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
- (3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.
- (4) Immediately notify the Deputy Assistant Secretary when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- (5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship

and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) of this clause.

- (6) Disseminate the Contractor's equal employment policy by--
- (i) Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;
- (ii) Including the policy in any policy manual and in collective bargaining agreements;
- (iii) Publicizing the policy in the company newspaper, annual report, etc.;
- (iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and
- (v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.
- (7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all on-site supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- (8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.
- (9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- (10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.
- (11) Validate all tests and other selection requirements where required under 41 CFR 60-3.
- (12) Conduct, at least annually, an inventory and evaluation at least of all minority and female

personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

- (13) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.
- (14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user rest rooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.
- (15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- (16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.
- (h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs (g)(1) through (16) of this clause. The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16) of this clause, provided the Contractor--
- (1) Actively participates in the group;
- (2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;
- (3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;
- (4) Makes a good-faith effort to meet its individual goals and timetables; and
- (5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
- (i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

- (j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
- (k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.
- (l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.
- (m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) of this clause, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Deputy Assistant Secretary shall take action as prescribed in 41 CFR 60-4.8.
- (n) The Contractor shall designate a responsible official to--
- (1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;
- (2) Submit reports as may be required by the Government; and
- (3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

(End of clause)

52.222-35 AFFIRMATIVE ACTION FOR DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (APR 1998)

(a)) Definitions. As used in this clause--

All employment openings includes all positions except executive and top management, those positions that will be filled from within the contractor's organization, and positions lasting 3 days or less. This term includes full-time employment, temporary employment of more than 3 days' duration, and part-time employment.

Appropriate office of the State employment service system means the local office of the Federal-State national system of public employment offices with assigned responsibility to serve the area where the employment opening is to be filled, including the District of Columbia, Guam, the Commonwealth of Puerto Rico, and the Virgin Islands.

Positions that will be filled from within the Contractor's organization means employment openings for which no consideration will be given to persons outside the Contractor's organization (including any affiliates, subsidiaries, and parent companies) and includes any openings that the Contractor proposes to fill from regularly established "recall" lists. The exception does not apply to a particular opening once an employer decides to consider applicants outside of its organization.

Veteran of the Vietnam era means a person who--

- (1) Served on active duty for a period of more than 180 days, any part of which occurred between August 5, 1964, and May 7, 1975, and was discharged or released therefrom with other than a dishonorable discharge; or
- (2) Was discharged or released from active duty for a service-connected disability if any part of such active duty was performed between August 5, 1964, and May 7, 1975.
- (b) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against the individual because the individual is a disabled veteran or a veteran of the Vietnam era. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based upon their disability or veterans' status in all employment practices such as--

(1) Employment;	
(ii) Upgrading;	

(') F 1

(iii) Demotion or transfer;

(iv) Recruitment;

- (v) Advertising;
- (vi) Layoff or termination;
- (vii) Rates of pay or other forms of compensation; and
- (viii) Selection for training, including apprenticeship.
- (2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended.
- (c) Listing openings. (1) The Contractor agrees to list all employment openings existing at contract award or occurring during contract performance, at an appropriate office of the State employment service system in the locality where the opening occurs. These openings include those occurring at any Contractor facility, including one not connected with performing this contract. An independent corporate affiliate is exempt from this requirement.
- (2) State and local government agencies holding Federal contracts of \$10,000 or more shall also list all their employment openings with the appropriate office of the State employment service.
- (3) The listing of employment openings with the State employment service system is required at least concurrently with using any other recruitment source or effort and involves the obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.
- (4) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State employment service system, in each State where it has establishments, of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State system, it need not advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.
- (d) Applicability. This clause does not apply to the listing of employment openings that occur and are filled outside the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, and the Virgin Islands.
- (e) Postings. (1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era, and (ii) the rights of applicants and employees.

- (2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, Department of Labor (Deputy Assistant Secretary), and provided by or through the Contracting Officer.
- (3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ, and advance in employment, qualified disabled veterans and veterans of the Vietnam Era.
- (f) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.
- (g) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of \$10,000 or more unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

52.222-36 AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (JUN 1998)

- (a) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental disability. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified individuals with disabilities without discrimination based upon their physical or mental disability in all employment practices such as--
- (i) Recruitment, advertising, and job application procedures;
- (ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff, and rehiring;
- (iii) Rates of pay or any other form of compensation and changes in compensation;
- (iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;
- (v) Leaves of absence, sick leave, or any other leave;
- (vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor:

- (vii) Selection and financial support for training, including apprenticeships, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;
- (viii) Activities sponsored by the Contractor, including social or recreational programs; and
- (ix) Any other term, condition, or privilege of employment.
- (2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.
- (b) Postings. (1) The Contractor agrees to post employment notices stating--
- (i) The Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified individuals with disabilities; and
- (ii) The rights of applicants and employees.
- (2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. The Contractor shall ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair). The notices shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance of the U.S. Department of Labor (Deputy Assistant Secretary) and shall be provided by or through the Contracting Officer.
- (3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified individuals with physical or mental disabilities.
- (c) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.
- (d) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of \$10,000 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

52.222-37 EMPLOYMENT REPORTS ON DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1999)

- (a) Unless the Contractor is a State or local government agency, the Contractor shall report at least annually, as required by the Secretary of Labor, on--
- (1) The number of disabled veterans and the number of veterans of the Vietnam era in the workforce of the contractor by job category and hiring location; and
- (2) The total number of new employees hired during the period covered by the report, and of that total, the number of disabled veterans, and the number of veterans of the Vietnam era.
- (b) The above items shall be reported by completing the form entitled "Federal Contractor Veterans' Employment Report VETS-100."
- (c) Reports shall be submitted no later than September 30 of each year beginning September 30, 1988.
- (d) The employment activity report required by paragraph (a)(2) of this clause shall reflect total hires during the most recent 12-month period as of the ending date selected for the employment profile report required by paragraph (a)(1) of this clause. Contractors may select an ending date: (1) As of the end of any pay period during the period January through March 1st of the year the report is due, or (2) as of December 31, if the contractor has previous written approval from the Equal Employment Opportunity Commission to do so for purposes of submitting the Employer Information Report EEO-1 (Standard Form 100).
- (e) The count of veterans reported according to paragraph (a) of this clause shall be based on voluntary disclosure. Each Contractor subject to the reporting requirements at 38 U.S.C. 4212 shall invite all disabled veterans and veterans of the Vietnam era who wish to benefit under the affirmative action program at 38 U.S.C. 4212 to identify themselves to the Contractor. The invitation shall state that the information is voluntarily provided; that the information will be kept confidential; that disclosure or refusal to provide the information will not subject the applicant or employee to any adverse treatment; and that the information will be used only in accordance with the regulations promulgated under 38 U.S.C. 4212.
- (f) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of \$10,000 or more unless exempted by rules, regulations, or orders of the Secretary.

(End of clause)

52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (JAN 1997)

- (a) "Hazardous material", as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).
- (b) The offeror must list any hazardous material, as defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material	Identification No.
(If none,	
insert "None")	

- (c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.
- (d) The apparently successful offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful offeror being considered nonresponsible and ineligible for award.
- (e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.
- (f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.
- (g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.
- (h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

- (1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to--
- (i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;
- (ii) Obtain medical treatment for those affected by the material; and
- (iii) Have others use, duplicate, and disclose the data for the Government for these purposes.
- (2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.
- (3) The Government is not precluded from using similar or identical data acquired from other sources.

52.223-14 TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)

- (a) Unless otherwise exempt, the Contractor, as owner or operator of a facility used in the performance of this contract, shall file by July 1 for the prior calendar year an annual Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023(a) and (g)), and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106). The Contractor shall file, for each facility subject to the Form R filing and reporting requirements, the annual Form R throughout the life of the contract.
- (b) A Contractor owned or operated facility used in the performance of this contract is exempt from the requirement to file an annual Form R if--
- (1) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);
- (2) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);
- (3) The facility does not meet the reporting thresholds of toxic chemicals established under of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

- (4) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or
- (5) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.
- (c) If the Contractor has certified to an exemption in accordance with one or more of the criteria in paragraph (b) of this clause, and after award of the contract circumstances change so that any of its owned or operated facilities used in the performance of this contract is no longer exempt-
- (1) The Contractor shall notify the Contracting Officer; and
- (2) The Contractor, as owner or operator of a facility used in the performance of this contract that is no longer exempt, shall (i) submit a Toxic Chemical Release Inventory Form (Form R) on or before July 1 for the prior calendar year during which the facility becomes eligible; and (ii) continue to file the annual Form R for the life of the contract for such facility.
- (d) The Contracting Officer may terminate this contract or take other action as appropriate, if the Contractor fails to comply accurately and fully with the EPCRA and PPA toxic chemical release filing and reporting requirements.
- (e) Except for acquisitions of commercial items, as defined in FAR Part 2, the Contractor shall--
- (1) For competitive subcontracts expected to exceed \$100,000 (including all options), include a solicitation provision substantially the same as the provision at FAR 52.223-13, Certification of Toxic Chemical Release Reporting; and
- (2) Include in any resultant subcontract exceeding \$100,000 (including all options), the substance of this clause, except this paragraph (e).

52.225-11 BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (JUL 2002)

(a) Definitions. As used in this clause--

Component means an article, material, or supply incorporated directly into a construction material.

Construction material means an article, material, or supply brought to the construction site by the Contractor or subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

Cost of components means--

- (1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or
- (2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the end product.

Designated country means any of the following countries: Aruba, Austria, Bangladesh, Belgium, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Canada, Cape Verde, Central African Republic, Chad, Comoros, Denmark.

Djibouti, Equatorial Guinea, Finland, France, Gambia, Germany, Greece, Guinea, Guinea-Bissau, Haiti, Hong Kong, Ireland, Israel, Italy, Japan.

Kiribati, Korea, Republic of, Lesotho, Liechtenstein, Luxembourg, Malawi, Maldives, Mali, Mozambique, Nepal, Netherlands, Niger, Norway, Portugal, Rwanda.

Sao Tome and Principe, Sierra Leone, Singapore, Somalia, Spain, Sweden, Switzerland, Tanzania U.R., Togo, Tuvalu, Uganda, United Kingdom, Vanuatu, Western Samoa, Yemen.

Designated country construction material means a construction material that-

- (1) Is wholly the growth, product, or manufacture of a designated country; or
- (2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

Domestic construction material means--

- (1) An unmanufactured construction material mined or produced in the United States; or
- (2) A construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic.

Foreign construction material means a construction material other than a domestic construction material.

North American Free Trade Agreement country means Canada or Mexico.

North American Free Trade Agreement country construction material means a construction material that--

- (1) Is wholly the growth, product, or manufacture of a North American Free Trade Agreement (NAFTA) country; or
- (2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

United States means the 50 States and the District of Columbia, U.S. territories and possessions, Puerto Rico, the Northern Mariana Islands, and any other place subject to U.S. jurisdiction, but does not include leased bases.

- (b) Construction materials. (1) This clause implements the Buy American Act (41 U.S.C. 10a-10d) and the Balance of Payments Program by providing a preference for domestic construction material. In addition, the Contracting Officer has determined that the Trade Agreements Act and the North American Free Trade Agreement (NAFTA) apply to this acquisition. Therefore, the Buy American Act restrictions are waived for designated country and NAFTA country construction materials.
- (2) The Contractor shall use only domestic, designated country, or NAFTA country construction material in performing this contract, except as provided in paragraphs (b)(3) and (b)(4) of this clause.
- (3) The requirement in paragraph (b)(2) of this clause does not apply to the construction materials or components listed by the Government as follows: None
- (4) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(3) of this clause if the Government determines that--
- (i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the restrictions of the Buy American Act is

unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent;

- (ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or
- (iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.
- (c) Request for determination of inapplicability of the Buy American Act.
- (1)(i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(4) of this clause shall include adequate information for Government evaluation of the request, including--
- (A) A description of the foreign and domestic construction materials;
- (B) Unit of measure;
- (C) Quantity;
- (D) Price;
- (E) Time of delivery or availability;
- (F) Location of the construction project;
- (G) Name and address of the proposed supplier; and
- (H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.
- (ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.
- (iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).
- (iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.
- (2) If the Government determines after contract award that an exception to the Buy American Act applies and the Contracting Officer and the Contractor negotiate adequate consideration, the

Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(4)(i) of this clause.

- (3) Unless the Government determines that an exception to the Buy American Act applies, use of foreign construction material is noncompliant with the Buy American Act.
- (d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Construction Materials Price Comparison				
Construction material description		•	, , , ,	
Item 1: Foreign construction material Domestic construction material Item 2: Foreign construction material Domestic construction material				
\1\ Include all delivery costs to the coduty-free entry certificate is issued). List name, address, telephone number response; if oral, attach summary. Include other applicable supporting in	onstruction site and any	applicable duty	(whether or not a	
include other applicable supporting in	mormanon.			

52.225-13 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUL 2000)

(a) The Contractor shall not acquire, for use in the performance of this contract, any supplies or services originating from sources within, or that were located in or transported from or through, countries whose products are banned from importation into the United States under regulations of the Office of Foreign Assets Control, Department of the Treasury. Those countries are Cuba, Iran, Iraq, Libya, North Korea, Sudan, the territory of Afghanistan controlled by the Taliban, and Serbia (excluding the territory of Kosovo).

(End of clause)

- (b) The Contractor shall not acquire for use in the performance of this contract any supplies or services from entities controlled by the government of Iraq.
- (c) The Contractor shall insert this clause, including this paragraph (c), in all subcontracts.

52.225-15 SANCTIONED EUROPEAN UNION COUNTRY END PRODUCTS (FEB 2000)

(a) Definitions. As used in this clause--

Sanctioned European Union country end product means an article that-

- (1) Is wholly the growth, product, or manufacture of a sanctioned European Union (EU) member state; or
- (2) In the case of an article that consists in whole or in part of materials from another country, has been substantially transformed in a sanctioned EU member state into a new and different article of commerce with a name, character, or use distinct from that of the article or articles from which it was transformed. The term refers to a product offered for purchase under a supply contract, but for purposes of calculating the value of the end product includes services (except transportation services) incidental to the article, provided that the value of those incidental services does not exceed that of the article itself.

Sanctioned European Union member state means Austria, Belgium, Denmark, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Sweden, or the United Kingdom.

(b) The Contractor shall not deliver any sanctioned European Union country end products under this contract.

(End of clause)

52.226-1 UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES (JUN 2000)

(a) Definitions. As used in this clause:

"Indian" means any person who is a member of any Indian tribe, band, group, pueblo or community that is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs (BIA) in accordance with 25 U.S.C. 1452(c) and any ``Native" as defined in the

Alaska Native Claims Settlement Act (43 U.S.C. 1601).

"Indian organization" means the governing body of any Indian tribe or entity established or recognized by the governing body of an Indian tribe for the purposes of 25 U.S.C., chapter 17.

"Indian-owned economic enterprise" means any Indian-owned (as determined by the Secretary of the Interior) commercial, industrial, or business activity established or organized for the purpose of profit, provided that Indian ownership constitute not less than 51 percent of the enterprise.

"Indian tribe" means any Indian tribe, band, group, pueblo or community, including native villages and native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, that is recognized by the Federal Government as eligible for services from BIA in accordance with 25 U.S.C. 1542(c).

"Interested party" means a prime contractor or an actual or prospective offeror whose direct economic interest would be affected by the award of a subcontract or by the failure to award a subcontract.

- (b) The Contractor shall use its best efforts to give Indian organizations and Indian-owned economic enterprises (25 U.S.C. 1544) the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with efficient performance of its contract.
- (1) The Contracting Officer and the Contractor, acting in good faith, may rely on the representation of an Indian organization or Indian-owned economic enterprise as to its eligibility, unless an interested party challenges its status or the Contracting Officer has independent reason to question that status. In the event of a challenge to the representation of a subcontractor, the Contracting Officer will refer the matter to the U.S. Department of the Interior, Bureau of Indian Affairs (BIA), Attn: Chief, Division of Contracting and Grants Administration, 1849 C Street, NW., MS 2626-MIB, Washington, DC 20240-4000.

The BIA will determine the eligibility and notify the Contracting Officer. No incentive payment will be made within 50 working days of subcontract award or while a challenge is pending. If a subcontractor is determined to be an ineligible participant, no incentive payment will be made under the Indian Incentive Program.

- (2) The Contractor may request an adjustment under the Indian Incentive Program to the following:
- (i) The estimated cost of a cost-type contract.
- (ii) The target cost of a cost-plus-incentive-fee prime contract.
- (iii) The target cost and ceiling price of a fixed-price incentive prime contract.
- (iv) The price of a firm-fixed-price prime contract.

- (3) The amount of the adjustment to the prime contract is 5 percent of the estimated cost, target cost, or firm-fixed-price included in the subcontract initially awarded to the Indian organization or Indian-owned economic enterprise.
- (4) The Contractor has the burden of proving the amount claimed and must assert its request for an adjustment prior to completion of contract performance.
- (c) The Contracting Officer, subject to the terms and conditions of the contract and the availability of funds, will authorize an incentive payment of 5 percent of the amount paid to the subcontractor. The Contracting Officer will seek funding in accordance with agency procedures.

52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)

- (a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention described in and covered by a United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.
- (b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed the simplified acquisition threshold (however, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.)

(End of clause)

52.227-2 NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (AUG 1996)

(a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this

contract of which the Contractor has knowledge.

- (b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed under this contract, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.
- (d) The Contractor agrees to include, and require inclusion of, this clause in all subcontracts at any tier for supplies or services (including construction and architect-engineer subcontracts and those for material, supplies, models, samples, or design or testing services) expected to exceed the simplified acquisition threshold at (FAR) 2.101.to exceed the dollar amount set forth in 13.000 of the Federal Acquisition Regulation (FAR).

(End of clause)

52.227-4 PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.

(End of clause)

52,228-2 ADDITIONAL BOND SECURITY (OCT 1997)

The Contractor shall promptly furnish additional security required to protect the Government and persons supplying labor or materials under this contract if--

- (a) Any surety upon any bond, or issuing financial institution for other security, furnished with this contract becomes unacceptable to the Government.
- (b) Any surety fails to furnish reports on its financial condition as required by the Government;
- (c) The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer; or

(d) An irrevocable letter of credit (ILC) used as security will expire before the end of the period of required security. If the Contractor does not furnish an acceptable extension or replacement ILC, or other acceptable substitute, at least 30 days before an ILC's scheduled expiration, the Contracting officer has the right to immediately draw on the ILC.

(End of clause)

52.228-11 PLEDGES OF ASSETS (FEB 1992)

- (a) Offerors shall obtain from each person acting as an individual surety on a bid guarantee, a performance bond, or a payment bond--
- (1) Pledge of assets; and
- (2) Standard Form 28, Affidavit of Individual Surety.
- (b) Pledges of assets from each person acting as an individual surety shall be in the form of--
- (1) Evidence of an escrow account containing cash, certificates of deposit, commercial or Government securities, or other assets described in FAR 28.203-2 (except see 28.203-2(b)(2) with respect to Government securities held in book entry form) and/or;
- (2) A recorded lien on real estate. The offeror will be required to provide--
- (i) Evidence of title in the form of a certificate of title prepared by a title insurance company approved by the United States Department of Justice. This title evidence must show fee simple title vested in the surety along with any concurrent owners; whether any real estate taxes are due and payable; and any recorded encumbrances against the property, including the lien filed in favor of the Government as required by FAR 28.203-3(d);
- (ii) Evidence of the amount due under any encumbrance shown in the evidence of title;
- (iii) A copy of the current real estate tax assessment of the property or a current appraisal dated no earlier than 6 months prior to the date of the bond, prepared by a professional appraiser who certifies that the appraisal has been conducted in accordance with the generally accepted appraisal standards as reflected in the Uniform Standards of Professional Appraisal Practice, as promulgated by the Appraisal Foundation.

(End of clause)

52.228-12 PROSPECTIVE SUBCONTRACTOR REQUESTS FOR BONDS. (OCT 1995)

In accordance with Section 806(a)(3) of Pub. L. 102-190, as amended by Sections 2091 and 8105 of Pub. L. 103-355, upon the request of a prospective subcontractor or supplier offering to furnish labor or material for the performance of this contract for which a payment bond has been furnished to the Government pursuant to the Miller Act, the Contractor shall promptly provide a copy of such payment bond to the requester.

(End of clause)

52.228-14 IRREVOCABLE LETTER OF CREDIT (DEC 1999)

- (a) "Irrevocable letter of credit" (ILC), as used in this clause, means a written commitment by a federally insured financial institution to pay all or part of a stated amount of money, until the expiration date of the letter, upon presentation by the Government (the beneficiary) of a written demand therefor. Neither the financial institution nor the offeror/Contractor can revoke or condition the letter of credit.
- (b) If the offeror intends to use an ILC in lieu of a bid bond, or to secure other types of bonds such as performance and payment bonds, the letter of credit and letter of confirmation formats in paragraphs (e) and (f) of this clause shall be used.
- (c) The letter of credit shall be irrevocable, shall require presentation of no document other than a written demand and the ILC (including confirming letter, if any), shall be issued/confirmed by an acceptable federally insured financial institution as provided in paragraph (d) of this clause, and-
- (1) If used as a bid guarantee, the ILC shall expire no earlier than 60 days after the close of the bid acceptance period;
- (2) If used as an alternative to corporate or individual sureties as security for a performance or payment bond, the offeror/Contractor may submit an ILC with an initial expiration date estimated to cover the entire period for which financial security is required or may submit an ILC with an initial expiration date that is a minimum period of one year from the date of issuance. The ILC shall provide that, unless the issuer provides the beneficiary written notice of non-renewal at least 60 days in advance of the current expiration date, the ILC is automatically extended without amendment for one year from the expiration date, or any future expiration date, until the period of required coverage is completed and the Contracting Officer provides the financial institution with a written statement waiving the right to payment. The period of required coverage shall be:
- (i) For contracts subject to the Miller Act, the later of--
- (A) One year following the expected date of final payment;
- (B) For performance bonds only, until completion of any warranty period; or
- (C) For payment bonds only, until resolution of all claims filed against the payment bond during

the one-year period following final payment. (ii) For contracts not subject to the Miller Act, the later of--(A) 90 days following final payment; or (B) For performance bonds only, until completion of any warranty period. (d) Only federally insured financial institutions rated investment grade or higher shall issue or confirm the ILC. The offeror/Contractor shall provide the Contracting Officer a credit rating that indicates the financial institution has the required rating(s) as of the date of issuance of the ILC. Unless the financial institution issuing the ILC had letter of credit business of less than \$25 million in the past year, ILCs over \$5 million must be confirmed by another acceptable financial institution that had letter of credit business of less than \$25 million in the past year. (e) The following format shall be used by the issuing financial institution to create an ILC: [Issuing Financial Institution's Letterhead or Name and Address] Issue Date IRREVOCABLE LETTER OF CREDIT NO. _____ Account party's name _____ Account party's address _____ For Solicitation No. ______(for reference only) TO: [U.S. Government agency]

[U.S. Government agency's address]

- 1. We hereby establish this irrevocable and transferable Letter of Credit in your favor for one or more drawings up to United States \$______. This Letter of Credit is payable at [issuing financial institution's and, if any, confirming financial institution's] office at [issuing financial institution's address and, if any, confirming financial institution's address] and expires with our close of business on _______, or any automatically extended expiration date.
- 2. We hereby undertake to honor your or the transferee's sight draft(s) drawn on the issuing or, if any, the confirming financial institution, for all or any part of this credit if presented with this Letter of Credit and confirmation, if any, at the office specified in paragraph 1 of this Letter of Credit on or before the expiration date or any automatically extended expiration date.

3. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this Letter of Credit that it is deemed to be automatically extended without amendment for one year from the expiration date hereof, or any future expiration date, unless at least 60 days prior to any expiration date, we notify you or the transferee by registered mail, or other receipted means of delivery, that we elect not to consider this Letter of Credit renewed for any such additional period. At the time we notify you, we also agree to notify the account party (and confirming financial institution, if any) by the same means of delivery. 4. This Letter of Credit is transferable. Transfers and assignments of proceeds are to be effected without charge to either the beneficiary or the transferee/assignee of proceeds. Such transfer or assignment shall be only at the written direction of the Government (the beneficiary) in a form satisfactory to the issuing financial institution and the confirming financial institution, if any. 5. This Letter of Credit is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of [state of confirming financial institution, if any, otherwise state of issuing financial institution]. 6. If this credit expires during an interruption of business of this financial institution as described in Article 17 of the UCP, the financial institution specifically agrees to effect payment if this credit is drawn against within 30 days after the resumption of our business. Sincerely, [Issuing financial institution] (f) The following format shall be used by the financial institution to confirm an ILC: [Confirming Financial Institution's Letterhead or Name and Address] (Date) _____ Our Letter of Credit Advice Number _____ Beneficiary: _____ [U.S. Government agency]

Issuing Financial Institution: _____

Issuing Financial Institution's LC No.:

Gentlemen:

1. We hereby confirm the above indicated Letter of Credit, the original of which is attached, issued by [name of issuing financial institution] for drawings of up to United States dollars /U.S. \$ and expiring with our close of business on
[the expiration date], or any automatically extended expiration date.
2. Draft(s) drawn under the Letter of Credit and this Confirmation are payable at our office located at
3. We hereby undertake to honor sight draft(s) drawn under and presented with the Letter of Credit and this Confirmation at our offices as specified herein.
4. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this confirmation that it be deemed automatically extended without amendment for one year from the expiration date hereof, or any automatically extended expiration date, unless:
(a) At least 60 days prior to any such expiration date, we shall notify the Contracting Officer, or the transferee and the issuing financial institution, by registered mail or other receipted means of delivery, that we elect not to consider this confirmation extended for any such additional period; or
(b) The issuing financial institution shall have exercised its right to notify you or the transferee, the account party, and ourselves, of its election not to extend the expiration date of the Letter of Credit.
5. This confirmation is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of [state of confirming financial institution].
6. If this confirmation expires during an interruption of business of this financial institution as described in Article 17 of the UCP, we specifically agree to effect payment if this credit is drawn against within 30 days after the resumption of our business.
Sincerely,

[Confirming financial institution]

(g) The following format shall be used by the Contracting Officer for a sight draft to draw on the Letter of Credit:

SIGHT DRAFT		
[City, State]		
(Date)		
[Name and address of financia	l institution]	
	[Beneficiary Agency] raft is drawn under Irrevocable Lette 	
[Beneficiary Agency]		
By:		
	(End of clause)	

52.228-15 PERFORMANCE AND PAYMENT BONDS--CONSTRUCTION (JUL 2000)-

(a) Definitions. As used in this clause--

Original contract price means the award price of the contract; or, for requirements contracts, the price payable for the estimated total quantity; or, for indefinite-quantity contracts, the price payable for the specified minimum quantity. Original contract price does not include the price of any options, except those options exercised at the time of contract award.

- (b) Amount of required bonds. Unless the resulting contract price is \$100,000 or less, the successful offeror shall furnish performance and payment bonds to the Contracting Officer as follows:
- (1) Performance bonds (Standard Form 25). The penal amount of performance bonds at the time of contract award shall be 100 percent of the original contract price.
- (2) Payment Bonds (Standard Form 25-A). The penal amount of payment bonds at the time of contract award shall be 100 percent of the original contract price.
- (3) Additional bond protection. (i) The Government may require additional performance and payment bond protection if the contract price is increased. The increase in protection generally will equal 100 percent of the increase in contract price.

- (ii) The Government may secure the additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.
- (c) Furnishing executed bonds. The Contractor shall furnish all executed bonds, including any necessary reinsurance agreements, to the Contracting Officer, within the time period specified in the Bid Guarantee provision of the solicitation, or otherwise specified by the Contracting Officer, but in any event, before starting work.
- (d) Surety or other security for bonds. The bonds shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, individual sureties, or by other acceptable security such as postal money order, certified check, cashier's check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Treasury Circular 570 is published in the Federal Register or may be obtained from the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, NW, 2nd Floor, West Wing, Washington, DC 20227.
- (e) Notice of subcontractor waiver of protection (40 U.S.C. 270b(c). Any waiver of the right to sue on the payment bond is void unless it is in writing, signed by the person whose right is waived, and executed after such person has first furnished labor or material for use in the performance of the contract.

52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)

- (a) "Contract date," as used in this clause, means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification.
- "All applicable Federal, State, and local taxes and duties," as used in this clause, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.
- "After-imposed Federal tax," as used in this clause, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.
- "After-relieved Federal tax," as used in this clause, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

- (b) The contract price includes all applicable Federal, State, and local taxes and duties.
- (c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.
- (d) The contract price shall be decreased by the amount of any after-relieved Federal tax.
- (e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Contractor is required to pay or bear, or does not obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.
- (f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds \$250.
- (g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.
- (h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

52.229-5 TAXES--CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO (APR 1984)

The term "local taxes," as used in the Federal, State, and local taxes clause of this contract, includes taxes imposed by a possession of the United States or by Puerto Rico.

(End of clause)

52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)

- (a) Payment of price. The Government shall pay the Contractor the contract price as provided in this contract.
- (b) Progress payments. The Government shall make progress payments monthly as the work

proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer.

- (1) The Contractor's request for progress payments shall include the following substantiation:
- (i) An itemization of the amounts requested, related to the various elements of work required by the contract covered by the payment requested.
- (ii) A listing of the amount included for work performed by each subcontractor under the contract.
- (iii) A listing of the total amount of each subcontract under the contract.
- (iv) A listing of the amounts previously paid to each such subcontractor under the contract.
- (v) Additional supporting data in a form and detail required by the Contracting Officer.
- (2) In the preparation of estimates, the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site also may be taken into consideration if--
- (i) Consideration is specifically authorized by this contract; and
- (ii) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.
- (c) Contractor certification. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete paragraph (c)(4) from the certification, the certification is still acceptable.)

I hereby certify, to the best of my knowledge and belief, that--

- (1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;
- (2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code;
- (3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

(4) This certifica	ition is not to be cons	trued as final acce	eptance of a subcon	tractor's perform	nance
(Name)					
(Title)					
(Date)					

- (d) Refund of unearned amounts. If the Contractor, after making a certified request for progress payments, discovers that a portion or all of such request constitutes a payment for performance by the Contractor that fails to conform to the specifications, terms, and conditions of this contract (hereinafter referred to as the "unearned amount"), the Contractor shall--
- (1) Notify the Contracting Officer of such performance deficiency; and
- (2) Be obligated to pay the Government an amount (computed by the Contracting Officer in the manner provided in paragraph (j) of this clause) equal to interest on the unearned amount from the 8th day after the date of receipt of the unearned amount until--
- (i) The date the Contractor notifies the Contracting Officer that the performance deficiency has been corrected; or
- (ii) The date the Contractor reduces the amount of any subsequent certified request for progress payments by an amount equal to the unearned amount.
- (e) Retainage. If the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer shall authorize payment to be made in full. However, if satisfactory progress has not been made, the Contracting Officer may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. When the work is substantially complete, the Contracting Officer may retain from previously withheld funds and future progress payments that amount the Contracting Officer considers adequate for protection of the Government and shall release to the Contractor all the remaining withheld funds. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment shall be made for the completed work without retention of a percentage.
- (f) Title, liability, and reservation of rights. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

- (1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or
- (2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.
- (g) Reimbursement for bond premiums. In making these progress payments, the Government shall, upon request, reimburse the Contractor for the amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor has furnished evidence of full payment to the surety. The retainage provisions in paragraph (e) of this clause shall not apply to that portion of progress payments attributable to bond premiums.
- (h) Final payment. The Government shall pay the amount due the Contractor under this contract after--
- (1) Completion and acceptance of all work;
- (2) Presentation of a properly executed voucher; and
- (3) Presentation of release of all claims against the Government arising by virtue of this contract, other than claims, in stated amounts, that Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 3727 and 41 U.S.C. 15).
- (i) Limitation because of undefinitized work. Notwithstanding any provision of this contract, progress payments shall not exceed 80 percent on work accomplished on undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in FAR Subpart 2.1, including contract modifications for additional supplies or services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes.
- (j) Interest computation on unearned amounts. In accordance with 31 U.S.C. 3903(c)(1), the amount payable under subparagraph (d)(2) of this clause shall be--
- (1) Computed at the rate of average bond equivalent rates of 91-day Treasury bills auctioned at the most recent auction of such bills prior to the date the Contractor receives the unearned amount; and
- (2) Deducted from the next available payment to the Contractor.

52.232-17 INTEREST (JUNE 1996)

- (a) Except as otherwise provided in this contract under a Price Reduction for Defective Cost or Pricing Data clause or a Cost Accounting Standards clause, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid. reproduce, prepare derivative works, distribute copies to the public, and (b) Amounts shall be due at the earliest of the following dates:
- (1) The date fixed under this contract.
- (2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.
- (3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.
- (4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.
- (c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.

(End of clause)

52.232-23 ASSIGNMENT OF CLAIMS (JAN 1986)

- (a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereafter referred to as "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence.
- (b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more

parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

(End of clause)

52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (FEB 2002)

Notwithstanding any other payment terms in this contract, the Government will make invoice payments under the terms and conditions specified in this clause. The Government considers payment as being made on the day a check is dated or the date of an electronic funds transfer. Definitions of pertinent terms are set forth in sections 2.101, 32.001, and 32.902 of the Federal Acquisition Regulation. All days referred to in this clause are calendar days, unless otherwise specified. (However, see paragraph (a)(3) concerning payments due on Saturdays, Sundays, and legal holidays.)

- (a) Invoice payments--(1) Types of invoice payments. For purposes of this clause, there are several types of invoice payments that may occur under this contract, as follows:
- (i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project.
- (A) The due date for making such payments is 14 days after the designated billing office receives a proper payment request. If the designated billing office fails to annotate the payment request with the actual date of receipt at the time of receipt, the payment due date is the 14th day after the date of the Contractor's payment request, provided the designated billing office receives a proper payment request and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.
- (B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, is as specified in the contract or, if not specified, 30 days after approval by the Contracting Officer for release to the Contractor.
- (ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract).
- (A) The due date for making such payments is the later of the following two events:

- (1) The 30th day after the designated billing office receives a proper invoice from the Contractor.
- (2) The 30th day after Government acceptance of the work or services completed by the Contractor. For a final invoice when the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance is deemed to occur on the effective date of the contract settlement.
- (B) If the designated billing office fails to annotate the invoice with the date of actual receipt at the time of receipt, the invoice payment due date is the 30th day after the date of the Contractor's invoice, provided the designated billing office receives a proper invoice and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.
- (2) Contractor's invoice. The Contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in paragraphs (a)(2)(i) through (a)(2)(xi) of this clause. If the invoice does not comply with these requirements, the designated billing office must return it within 7 days after receipt, with the reasons why it is not a proper invoice. When computing any interest penalty owed the Contractor, the Government will take into account if the Government notifies the Contractor of an improper invoice in an untimely manner.
- (i) Name and address of the Contractor.
- (ii) Invoice date and invoice number. (The Contractor should date invoices as close as possible to the date of mailing or transmission.)
- (iii) Contract number or other authorization for work or services performed (including order number and contract line item number).
- (iv) Description of work or services performed.
- (v) Delivery and payment terms (e.g., discount for prompt payment terms).
- (vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).
- (vii) Name (where practicable), title, phone number, and mailing address of person to notify in the event of a defective invoice.
- (viii) For payments described in paragraph (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts.
- (ix) Taxpayer Identification Number (TIN). The Contractor shall include its TIN on the invoice only if required elsewhere in this contract.

- (x) Electronic funds transfer (EFT) banking information.
- (A) The Contractor shall include EFT banking information on the invoice only if required elsewhere in this contract.
- (B) If EFT banking information is not required to be on the invoice, in order for the invoice to be a proper invoice, the Contractor shall have submitted correct EFT banking information in accordance with the applicable solicitation provision (e.g., 52.232-38, Submission of Electronic Funds Transfer Information with Offer), contract clause (e.g., 52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration, or 52.232-34, Payment by Electronic Funds Transfer--Other Than Central Contractor Registration), or applicable agency procedures.
- (C) EFT banking information is not required if the Government waived the requirement to pay by EFT.
- (xi) Any other information or documentation required by the contract.
- (3) Interest penalty. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if payment is not made by the due date and the conditions listed in paragraphs (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday, the designated payment office may make payment on the following working day without incurring a late payment interest penalty.
- (i) The designated billing office received a proper invoice.
- (ii) The Government processed a receiving report or other Government documentation authorizing payment and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.
- (iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.
- (4) Computing penalty amount. The Government will compute the interest penalty in accordance with the Office of Management and Budget prompt payment regulations at 5 CFR part 1315.
- (i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in paragraph (a)(1)(ii) of this clause, Government acceptance or approval is deemed to occur constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. If actual acceptance or approval occurs within the constructive acceptance or approval period, the Government will base the determination of an interest penalty on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These

requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

- (ii) The prompt payment regulations at 5 CFR 1315.10(c) do not require the Government to pay interest penalties if payment delays are due to disagreement between the Government and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. The Government and the Contractor shall resolve claims involving disputes, and any interest that may be payable in accordance with the clause at FAR 52.233-1, Disputes.
- (5) Discounts for prompt payment. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if the Government takes a discount for prompt payment improperly. The Government will calculate the interest penalty in accordance with the prompt payment regulations at 5 CFR part 1315.
- (6) Additional interest penalty. (i) The designated payment office will pay a penalty amount, calculated in accordance with the prompt payment regulations at 5 CFR part 1315 in addition to the interest penalty amount only if--
- (A) The Government owes an interest penalty of \$1 or more;
- (B) The designated payment office does not pay the interest penalty within 10 days after the date the invoice amount is paid; and
- (C) The Contractor makes a written demand to the designated payment office for additional penalty payment, in accordance with paragraph (a)(6)(ii) of this clause, postmarked not later than 40 days after the date the invoice amount is paid.
- (ii)(A) The Contractor shall support written demands for additional penalty payments with the following data. The Government will not request any additional data. The Contractor shall--
- (1) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;
- (2) Attach a copy of the invoice on which the unpaid late payment interest was due; and
- (3) State that payment of the principal has been received, including the date of receipt.
- (B) If there is no postmark or the postmark is illegible--
- (1) The designated payment office that receives the demand will annotate it with the date of receipt provided the demand is received on or before the 40th day after payment was made; or

- (2) If the designated payment office fails to make the required annotation, the Government will determine the demand's validity based on the date the Contractor has placed on the demand, provided such date is no later than the 40th day after payment was made.
- (b) Contract financing payments. If this contract provides for contract financing, the Government will make contract financing payments in accordance with the applicable contract financing clause.
- (c) Subcontract clause requirements. The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:
- (1) Prompt payment for subcontractors. A payment clause that obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.
- (2) Interest for subcontractors. An interest penalty clause that obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--
- (i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and
- (ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.
- (3) Subcontractor clause flowdown. A clause requiring each subcontractor to use:
- (i) Include a payment clause and an interest penalty clause conforming to the standards set forth in paragraphs (c)(1) and (c)(2) of this clause in each of its subcontracts; and
- (ii) Require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.
- (d) Subcontract clause interpretation. The clauses required by paragraph (c) of this clause shall not be construed to impair the right of the Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions that--
- (1) Retainage permitted. Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract,

giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

- (2) Withholding permitted. Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and
- (3) Withholding requirements. Permit such withholding without incurring any obligation to pay a late payment penalty if--
- (i) A notice conforming to the standards of paragraph (g) of this clause previously has been furnished to the subcontractor; and
- (ii) The Contractor furnishes to the Contracting Officer a copy of any notice issued by a Contractor pursuant to paragraph (d)(3)(i) of this clause.
- (e) Subcontractor withholding procedures. If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--
- (1) Subcontractor notice. Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;
- (2) Contracting Officer notice. Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to paragraph (e)(1) of this clause;
- (3) Subcontractor progress payment reduction. Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under paragraph (e)(1) of this clause;
- (4) Subsequent subcontractor payment. Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--
- (i) Make such payment within--
- (A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under paragraph (e)(5)(i)) of this clause; or
- (B) Seven days after the Contractor recovers such funds from the Government; or

- (ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;
- (5) Notice to Contracting Officer. Notify the Contracting Officer upon-
- (i) Reduction of the amount of any subsequent certified application for payment; or
- (ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--
- (A) The amounts withheld under paragraph (e)(1) of this clause; and
- (B) The dates that such withholding began and ended; and
- (6) Interest to Government. Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--
- (i) The day the identified subcontractor performance deficiency is corrected; or
- (ii) The date that any subsequent payment is reduced under paragraph (e)(5)(i) of this clause.
- (f) Third-party deficiency reports--(1) Withholding from subcontractor. If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, the Contractor may, without incurring an obligation to pay an interest penalty under paragraph (e)(6) of this clause--
- (i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and
- (ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under paragraph (f)(1)(i) of this clause.
- (2) Subsequent payment or interest charge. As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall--

- (i) Pay the amount withheld under paragraph (f)(1)(ii) of this clause to such first-tier subcontractor; or
- (ii) Incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts DisputesAct of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.
- (g) Written notice of subcontractor withholding. The Contractor shall issue a written notice of any withholding to a subcontractor (with a copy furnished to the Contracting Officer), specifying-
- (1) The amount to be withheld;
- (2) The specific causes for the withholding under the terms of the subcontract; and
- (3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.
- (h) Subcontractor payment entitlement. The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.
- (i) Prime-subcontractor disputes. A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the Government is a party. The Government may not be interpleaded in any judicial or administrative proceeding involving such a dispute.
- (j) Preservation of prime-subcontractor rights. Except as provided in paragraph (i) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.
- (k) Non-recourse for prime contractor interest penalty. The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the Government for such interest penalty. A cost-reimbursement claim may not include any amount for reimbursement of such interest penalty.

(1) Overpayments. If the Contractor becomes aware of a duplicate payment or that the Government has otherwise overpaid on an invoice payment, the Contractor shall immediately notify the Contracting Officer and request instructions for disposition of the overpayment.

(End of clause)

52.232-33 PAYMENT BY ELECTRONIC FUNDS TRANSFER—CENTRAL CONTRACTOR REGISTRATION (MAY 1999)

- (a) Method of payment. (1) All payments by the Government under this contract shall be made by electronic funds transfer (EFT), except as provided in paragraph (a)(2) of this clause. As used in this clause, the term "EFT" refers to the funds transfer and may also include the payment information transfer.
- (2) In the event the Government is unable to release one or more payments by EFT, the Contractor agrees to either--
- (i) Accept payment by check or some other mutually agreeable method of payment; or
- (ii) Request the Government to extend the payment due date until such time as the Government can make payment by EFT (but see paragraph (d) of this clause).
- (b) Contractor's EFT information. The Government shall make payment to the Contractor using the EFT information contained in the Central Contractor Registration (CCR) database. In the event that the EFT information changes, the Contractor shall be responsible for providing the updated information to the CCR database.
- (c) Mechanisms for EFT payment. The Government may make payment by EFT through either the Automated Clearing House (ACH) network, subject to the rules of the National Automated Clearing House Association, or the Fedwire Transfer System. The rules governing Federal payments through the ACH are contained in 31 CFR part 210.
- (d) Suspension of payment. If the Contractor's EFT information in the CCR database is incorrect, then the Government need not make payment to the Contractor under this contract until correct EFT information is entered into the CCR database; and any invoice or contract financing request shall be deemed not to be a proper invoice for the purpose of prompt payment under this contract. The prompt payment terms of the contract regarding notice of an improper invoice and delays in accrual of interest penalties apply.
- (e) Contractor EFT arrangements. If the Contractor has identified multiple payment receiving points (i.e., more than one remittance address and/or EFT information set) in the CCR database, and the Contractor has not notified the Government of the payment receiving point applicable to

this contract, the Government shall make payment to the first payment receiving point (EFT information set or remittance address as applicable) listed in the CCR database.

- (f) Liability for uncompleted or erroneous transfers. (1) If an uncompleted or erroneous transfer occurs because the Government used the Contractor's EFT information incorrectly, the Government remains responsible for--
- (i) Making a correct payment;
- (ii) Paying any prompt payment penalty due; and
- (iii) Recovering any erroneously directed funds.
- (2) If an uncompleted or erroneous transfer occurs because the Contractor's EFT information was incorrect, or was revised within 30 days of Government release of the EFT payment transaction instruction to the Federal Reserve System, and--
- (i) If the funds are no longer under the control of the payment office, the Government is deemed to have made payment and the Contractor is responsible for recovery of any erroneously directed funds; or
- (ii) If the funds remain under the control of the payment office, the Government shall not make payment, and the provisions of paragraph (d) of this clause shall apply.
- (g) EFT and prompt payment. A payment shall be deemed to have been made in a timely manner in accordance with the prompt payment terms of this contract if, in the EFT payment transaction instruction released to the Federal Reserve System, the date specified for settlement of the payment is on or before the prompt payment due date, provided the specified payment date is a valid date under the rules of the Federal Reserve System.
- (h) EFT and assignment of claims. If the Contractor assigns the proceeds of this contract as provided for in the assignment of claims terms of this contract, the Contractor shall require as a condition of any such assignment, that the assignee shall register in the CCR database and shall be paid by EFT in accordance with the terms of this clause. In all respects, the requirements of this clause shall apply to the assignee as if it were the Contractor. EFT information that shows the ultimate recipient of the transfer to be other than the Contractor, in the absence of a proper assignment of claims acceptable to the Government, is incorrect EFT information within the meaning of paragraph (d) of this clause.
- (i) Liability for change of EFT information by financial agent. The Government is not liable for errors resulting from changes to EFT information made by the Contractor's financial agent.
- (j) Payment information. The payment or disbursing office shall forward to the Contractor available payment information that is suitable for transmission as of the date of release of the EFT instruction to the Federal Reserve System. The Government may request the Contractor to

designate a desired format and method(s) for delivery of payment information from a list of formats and methods the payment office is capable of executing. However, the Government does not guarantee that any particular format or method of delivery is available at any particular payment office and retains the latitude to use the format and delivery method most convenient to the Government. If the Government makes payment by check in accordance with paragraph (a) of this clause, the Government shall mail the payment information to the remittance address contained in the CCR database.

(End of Clause)

52.233-1 **DISPUTES (JUL 2002)**

- (a) This contract is subject to the Contract Disputes Act of 1978, as amended (41 U.S.C. 601-613).
- (b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.
- (c) Claim, as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding \$100,000 is not a claim under the Act until certified. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.
- (d)(1) A claim by the Contractor shall be made in writing and, unless otherwise stated in this contract, submitted within 6 years after accrual of the claim to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.
- (2)(i) The contractors shall provide the certification specified in subparagraph (d)(2)(iii) of this clause when submitting any claim -
- (A) Exceeding \$100,000; or
- (B) Regardless of the amount claimed, when using -
- (1) Arbitration conducted pursuant to 5 U.S.C. 575-580; or
- (2) Any other alternative means of dispute resolution (ADR) technique that the agency elects to

handle in accordance with the Administrative Dispute Resolution Act (ADRA).

- (ii) The certification requirement does not apply to issues in controversy that have not been submitted as all or part of a claim.
- (iii) The certification shall state as follows: "I certify that the claim is made in good faith; that the supporting data are accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable; and that I am duly authorized to certify the claim on behalf of the Contractor.
- (3) The certification may be executed by any person duly authorized to bind the Contractor with respect to the claim.
- (e) For Contractor claims of \$100,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over \$100,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.
- (f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.
- (g) If the claim by the Contractor is submitted to the Contracting Officer or a claim by the Government is presented to the Contractor, the parties, by mutual consent, may agree to use alternative disput resolution (ADR). If the Contractor refuses an offer for ADR, the Contractor shall inform the Contracting Officer, in writing, of the Contractor's specific reasons for rejecting the request.
- (h) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (certified, if required); or (2) the date that payment otherwise would be due, if that date is later, until the date of payment. With regard to claims having defective certifications, as defined in (FAR) 48 CFR 33.201, interest shall be paid from the date that the Contracting Officer initially receives the claim. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.
- (i) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under the contract, and comply with any decision of the Contracting Officer.

(End of clause)

52.233-3 PROTEST AFTER AWARD (AUG. 1996)

- (a) Upon receipt of a notice of protest (as defined in FAR 33.101) or a determination that a protest is likely (see FAR 33.102(d)), the Contracting Officer may, by written order to the Contractor, direct the Contractor to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--
- (1) Cancel the stop-work order; or
- (2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.
- (b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing, accordingly, if--
- (1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and
- (2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal at any time before final payment under this contract.
- (c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.
- (d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.
- (e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.
- (f) If, as the result of the Contractor's intentional or negligent misstatement, misrepresentation, or miscertification, a protest related to this contract is sustained, and the Government pays costs, as provided in FAR 33.102(b)(2) or 33.104(h)(1), the Government may require the Contractor to reimburse the Government the amount of such costs. In addition to any other remedy available,

and pursuant to the requirements of Subpart 32.6, the Government may collect this debt by offsetting the amount against any payment due the Contractor under any contract between the Contractor and the Government.

(End of clause)

52.236-2 DIFFERING SITE CONDITIONS (APR 1984)

As prescribed in 36.502, insert the following clause in solicitations and contracts when a fixed-price construction contract or a fixed-price dismantling, demolition, or removal of improvements contract is contemplated and the contract amount is expected to exceed the small purchase limitation. The Contracting Officer may insert the clause in solicitations and contracts when a fixed-price construction or a fixed-price contract for dismantling, demolition, or removal of improvements is contemplated and the contract amount is expected to be within the small purchase limitation.

- (a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of
- (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or
- (2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.
- (b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.
- (c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.
- (d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

(End of clause)

52.236-3 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)

- (a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to
- (1) conditions bearing upon transportation, disposal, handling, and storage of materials;
- (2) the availability of labor, water, electric power, and roads;
- (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site;
- (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Government.
- (b) The Government assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Government. Nor does the Government assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

(End of clause)

52.236-5 MATERIAL AND WORKMANSHIP (APR 1984)

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

- (b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.
- (c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the worksite a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(End of clause)

52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(End of clause)

52.236-8 OTHER CONTRACTS (APR 1984)

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Government employees.

(End of clause)

52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)

- (a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- (b) The Contractor shall protect from damage all existing improvements and utilities
- (1) at or near the work site, and
- (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(End of clause)

52.236-10 OPERATIONS AND STORAGE AREAS (APR 1984)

- (a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- (b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and

materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(End of clause)

52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)

- (a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.
- (b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

(End of clause)

52.236-12 CLEANING UP (APR 1984)

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

52.236-13 ACCIDENT PREVENTION (NOV 1991) – ALTERNATE I (NOV 1991)

- (a) The Contractor shall provide and maintain work environments and procedures which will
- (1) safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;
- (2) avoid interruptions of Government operations and delays in project completion dates; and
- (3) control costs in the performance of this contract.
- (b) For these purposes on contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall-
- (1) Provide appropriate safety barricades, signs, and signal lights;
- (2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and
- (3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the purposes are taken.
- (e) If this contract is for construction or dismantling, demolition or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation.
- (c) Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.
- (e) The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

- (f) Before commencing the work, the Contractor shall-
- (1) Submit a written proposed plan for implementing this clause. The plan shall include an analysis of the significant hazards to life, limb, and property inherent in contract work performance and a plan for controlling these hazards; and
- (2) Meet with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)

- (a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.
- (b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.
- (c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of this contract.

(End of clause)

52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)

- (a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.
- (b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by," or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.
- (c) Where "as shown," as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place," that is "furnished and installed".
- (d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, or any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements, and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.
- (e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

- (f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.
- (g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor.

52.236-26 PRECONSTRUCTION CONFERENCE (FEB 1995)

If the Contracting Officer decides to conduct a preconstruction conference, the successful offeror will be notified and will be required to attend. The Contracting Officer's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

(End of clause)

52.242-13 BANKRUPTCY (JUL 1995)

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the Contracting Officer responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of Government contract numbers and contracting offices for all Government contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

(End of clause)

52.242-14 SUSPENSION OF WORK (APR 1984)

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract. (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

(End of clause)

52.243-4 CHANGES (AUG 1987)

- (a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes--
- (1) In the specifications (including drawings and designs);
- (2) In the method or manner of performance of the work;
- (3) In the Government-furnished facilities, equipment, materials, services, or site; or
- (4) Directing acceleration in the performance of the work.
- (b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating
- (1) the date, circumstances, and source of the order and
- (2) that the Contractor regards the order as a change order.
- (c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer

shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

- (d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.
- (e) The Contractor must assert its right to an adjustment under this clause within 30 days after
- (1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.
- (f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(End of clause)

52.244-6 SUBCONTRACTS FOR COMMERCIAL ITEMS (MAY 2002)

(a) Definitions. As used this clause--

"Commercial item", has the meaning contained in the clause at 52.202-1, Definitions.

- "Subcontract", includes a transfer of commercial items between divisions, subsidiaries, or affiliates of the Contractor or subcontractor at any tier.
- (b) To the maximum extent practicable, the Contractor shall incorporate, and require its subcontractors at all tiers to incorporate, commercial items or nondevelopmental items as components of items to be supplied under this contract.
- (c)(1) The Contractor shall insert the following clauses in subcontracts for commercial items:
- (i) 52.219-8, Utilization of Small Business Concerns (OCT 2000) (15 U.S.C. 637(d)(2) and (3)), in all subcontracts that offer further subcontracting opportunities. If the subcontract (except subcontracts to small business concerns) exceeds \$500,000 (\$1,000,000 for construction of any

public facility), the subcontractor must include 52.219-8 in lower tier subcontracts that offer subcontracting opportunities.

- (ii) 52.222-26, Equal Opportunity (APR 2002) (E.O. 11246).
- (iii) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era and Other Eligible Veterans (DEC 2001) (38 U.S.C. 4212(a)).
- (iv) 52.222-36, Affirmative Action for Workers with Disabilities (JUN 1998) (29 U.S.C. 793).
- (v) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (JUN 2000) (46 U.S.C. Appx 1241) (flowdown not required for subcontracts awarded beginning May 1, 1996).
- (2) While not required, the Contractor may flow down to subcontracts for commercial items a minimal number of additional clauses necessary to satisfy its contractual obligations.
- (d) The Contractor shall include the terms of this clause, including this paragraph (d), in subcontracts awarded under this contract.

(End of clause)

52.245-2 GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (DEC 1989)

- (a) Government-furnished property. (1) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications together with any related data and information that the Contractor may request and is reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").
- (2) The delivery or performance dates for this contract are based upon the expectation that Government-furnished property suitable for use (except for property furnished "as is") will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet the contract's delivery or performance dates.
- (3) If Government-furnished property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt of it, notify the Contracting Officer, detailing the facts, and, as directed by the Contracting Officer and at Government expense, either repair, modify, return, or otherwise dispose of the property. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall make an equitable adjustment as provided in paragraph (h) of this clause.
- (4) If Government-furnished property is not delivered to the Contractor by the required time, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of

the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.

- (b) Changes in Government-furnished property. (1) The Contracting Officer may, by written notice, (i) decrease the Government-furnished property provided or to be provided under this contract, or (ii) substitute other Government-furnished property for the property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct regarding the removal, shipment, or disposal of the property covered by such notice.
- (2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make the property available for performing this contract and there is any--
- (i) Decrease or substitution in this property pursuant to subparagraph (b)(1) of this clause; or
- (ii) Withdrawal of authority to use this property, if provided under any other contract or lease.
- (c) Title in Government property. (1) The Government shall retain title to all Government-furnished property.
- (2) All Government-furnished property and all property acquired by the Contractor, title to which vests in the Government under this paragraph (collectively referred to as "Government property"), are subject to the provisions of this clause. However, special tooling accountable to this contract is subject to the provisions of the Special Tooling clause and is not subject to the provisions of this clause. Title to Government property shall not be affected by its incorporation into or attachment to any property not owned by the Government, nor shall Government property become a fixture or lose its identity as personal property by being attached to any real property.
- (3) Title to each item of facilities and special test equipment acquired by the Contractor for the Government under this contract shall pass to and vest in the Government when its use in performing this contract commences or when the Government has paid for it, whichever is earlier, whether or not title previously vested in the Government.
- (4) If this contract contains a provision directing the Contractor to purchase material for which the Government will reimburse the Contractor as a direct item of cost under this contract-
- (i) Title to material purchased from a vendor shall pass to and vest in the Government upon the vendor's delivery of such material; and
- (ii) Title to all other material shall pass to and vest in the Government upon--
- (A) Issuance of the material for use in contract performance;

- (B) Commencement of processing of the material or its use in contract performance; or
- (C) Reimbursement of the cost of the material by the Government, whichever occurs first.
- (d) Use of Government property. The Government property shall be used only for performing this contract, unless otherwise provided in this contract or approved by the Contracting Officer.
- (e) Property administration. (1) The Contractor shall be responsible and accountable for all Government property provided under this contract and shall comply with Federal Acquisition Regulation (FAR) Subpart 45.5, as in effect on the date of this contract.
- (2) The Contractor shall establish and maintain a program for the use, maintenance, repair, protection, and preservation of Government property in accordance with sound industrial practice and the applicable provisions of Subpart 45.5 of the FAR.
- (3) If damage occurs to Government property, the risk of which has been assumed by the Government under this contract, the Government shall replace the items or the Contractor shall make such repairs as the Government directs. However, if the Contractor cannot effect such repairs within the time required, the Contractor shall dispose of the property as directed by the Contracting Officer. When any property for which the Government is responsible is replaced or repaired, the Contracting Officer shall make an equitable adjustment in accordance with paragraph (h) of this clause.
- (4) The Contractor represents that the contract price does not include any amount for repairs or replacement for which the Government is responsible. Repair or replacement of property for which the Contractor is responsible shall be accomplished by the Contractor at its own expense.
- (f) Access. The Government and all its designees shall have access at all reasonable times to the premises in which any Government property is located for the purpose of inspecting the Government property.
- (g) Risk of loss. Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss or destruction of, or damage to, Government property upon its delivery to the Contractor or upon passage of title to the Government under paragraph (c) of this clause. However, the Contractor is not responsible for reasonable wear and tear to Government property or for Government property properly consumed in performing this contract.
- (h) Equitable adjustment. When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the Government. The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suit for breach of contract for--
- (1) Any delay in delivery of Government-furnished property;

- (2) Delivery of Government-furnished property in a condition not suitable for its intended use;
- (3) A decrease in or substitution of Government-furnished property; or
- (4) Failure to repair or replace Government property for which the Government is responsible.
- (i) Final accounting and disposition of Government property. Upon completing this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property (including any resulting scrap) not consumed in performing this contract or delivered to the Government. The Contractor shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as the Contracting Officer directs.
- (j) Abandonment and restoration of Contractor's premises. Unless otherwise provided herein, the Government--
- (1) May abandon any Government property in place, at which time all obligations of the Government regarding such abandoned property shall cease; and
- (2) Has no obligation to restore or rehabilitate the Contractor's premises under any circumstances (e.g., abandonment, disposition upon completion of need, or upon contract completion). However, if the Government-furnished property (listed in the Schedule or specifications) is withdrawn or is unsuitable for the intended use, or if other Government property is substituted, then the equitable adjustment under paragraph (h) of this clause may properly include restoration or rehabilitation costs.
- (k) Communications. All communications under this clause shall be in writing.
- (l) Overseas contracts. If this contract is to be performed outside of the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

52.245-4 GOVERNMENT-FURNISHED PROPERTY (SHORT FORM) (APR 1984)

(a) The Government shall deliver to the Contractor, at the time and locations stated in this contract, the Government-furnished property described in the Schedule or specifications. If that property, suitable for its intended use, is not delivered to the Contractor, the Contracting Officer

shall equitably adjust affected provisions of this contract in accordance with the Changes clause when--

- (1) The Contractor submits a timely written request for an equitable adjustment; and
- (2) The facts warrant an equitable adjustment.
- (b) Title to Government-furnished property shall remain in the Government. The Contractor shall use the Government-furnished property only in connection with this contract. The Contractor shall maintain adequate property control records in accordance with sound industrial practice and will make such records available for Government inspection at all reasonable times, unless the clause at Federal Acquisition Regulation 52.245-1, Property Records, is included in this contract.
- (c) Upon delivery of Government-furnished property to the Contractor, the Contractor assumes the risk and responsibility for its loss or damage, except--
- (1) For reasonable wear and tear;
- (2) To the extent property is consumed in performing this contract; or
- (3) As otherwise provided for by the provisions of this contract.
- (d) Upon completing this contract, the Contractor shall follow the instructions of the Contracting Officer regarding the disposition of all Government-furnished property not consumed in performing this contract or previously delivered to the Government. The Contractor shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property, as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as directed by the Contracting Officer.
- (e) If this contract is to be performed outside the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

(End of clause)

52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)

- (a) Definition. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.
- (b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the

Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

- (c) Government inspections and tests are for the sole benefit of the Government and do not--
- (1) Relieve the Contractor of responsibility for providing adequate quality control measures;
- (2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;
- (3) Constitute or imply acceptance; or
- (4) Affect the continuing rights of the Government after acceptance of the completed work under paragraph (i) of this section.
- (d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.
- (e) The Contractor shall promptly furnish, at no increase in contract price, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.
- (f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements, unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
- (g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.
- (h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and

reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.

(End of clause)

52.248-3 VALUE ENGINEERING--CONSTRUCTION (FEB 2000) - ALTERNATE I (APR 1984)

- (a) General. The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.
- (b) Definitions. "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.
- "Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.
- "Contractor's development and implementation costs," as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.
- "Government costs," as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.
- "Instant contract savings," as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).
- "Value engineering change proposal (VECP)" means a proposal that--
- (1) Requires a change to this, the instant contract, to implement; and

- (2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change--
- (i) In deliverable end item quantities only; or
- (ii) To the contract type only.
- (c) VECP preparation. As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:
- (1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.
- (2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.
- (3) A separate, detailed cost estimate for (i) the affected portions of the existing contract requirement and (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.
- (4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.
- (5) A prediction of any effects the proposed change would have on collateral costs to the agency.
- (6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.
- (7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.
- (d) Submission. The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.
- (e) Government action. (1) The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer shall notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

- (2) If the VECP is not accepted, the Contracting Officer shall notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.
- (3) Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The decision to accept or reject all or part of any VECP is a unilateral decision made solely at the discretion of the Contracting Officer.
- (f) Sharing.
- (1) Rates. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by (i) 45 percent for fixed-price contracts or (ii) 75 percent for cost-reimbursement contracts.
- (2) Payment. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to--
- (i) Accept the VECP;
- (ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and
- (iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.
- (g) Subcontracts. The Contractor shall include an appropriate value engineering clause in any subcontract of \$50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; provided, that these payments shall not reduce the Government's share of the savings resulting from the VECP.
- (h) Data. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering--Construction clause of contract , shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations."

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

(j) Collateral savings. If a VECP is accepted, the Contracting Officer will increase the instant contract amount by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings will not exceed the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or \$100,000, whichever is greater. The Contracting Officer will be the sole determiner of the amount of collateral savings.

(End of clause)

52.249-1 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SHORT FORM) (APR 1984)

The Contracting Officer, by written notice, may terminate this contract, in whole or in part, when it is in the Government's interest. If this contract is terminated, the rights, duties, and obligations of the parties, including compensation to the Contractor, shall be in accordance with Part 49 of the Federal Acquisition Regulation in effect on the date of this contract.

(End of clause)

52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996) - ALTERNATE I (SEP 1996)

- (a) The Government may terminate performance of work under this contract in whole or, from time to time, in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.
- (b) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

- (1) Stop work as specified in the notice.
- (2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.
- (3) Terminate all subcontracts to the extent they relate to the work terminated.
- (4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.
- (5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.
- (6) As directed by the Contracting Officer, transfer title and deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.
- (7) Complete performance of the work not terminated.
- (8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.
- (9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (b)(6) of this clause; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.
- (c) The Contractor shall submit complete termination inventory schedules no later than 120 days from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 120-day period.
- (d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the

Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

- (e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.
- (f) Subject to paragraph (e) of this clause, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid or remaining to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (g) or paragraph (g) of this clause, exclusive of costs shown in subparagraph (g)(3) of this clause, may not exceed the total contract price as reduced by (1) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be modified, and the Contractor paid the agreed amount. Paragraph (g) of this clause shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.
- (g) If the Contractor and Contracting Officer fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under paragraph (f) of this clause:
- (1) For contract work performed before the effective date of termination, the total (without duplication of any items) of--
- (i) The cost of this work;
- (ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (g)(1)(i) of this clause; and
- (iii) A sum, as profit on subdivision (g)(1)(i) of this clause, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

- (2) The reasonable costs of settlement of the work terminated, including--
- (i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;
- (ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and
- (iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.
- (h) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (g) of this clause, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.
- (i) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.
- (j) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (e), (g), or (l) of this clause, except that if the Contractor failed to submit the termination settlement proposal or request for equitable adjustment within the time provided in paragraph (e) or (l), respectively, and failed to request a time extension, there is no right of appeal.
- (k) In arriving at the amount due the Contractor under this clause, there shall be deducted-
- (1) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract:
- (2) Any claim which the Government has against the Contractor under this contract; and
- (3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.
- (1) If the termination is partial, the Contractor may file a proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

- (m)(1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.
- (2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.
- (n) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)

- (a) If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified in this contract including any extension, or fails to complete the work within this time, the Government may, by written notice to the Contractor, terminate the right to proceed with the work (or the separable part of the work) that has been delayed. In this event, the Government may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Government resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Government in completing the work.
- (b) The Contractor's right to proceed shall not be terminated nor the Contractor charged with damages under this clause, if--
- (1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include

- (i) acts of God or of the public enemy,
- (ii) acts of the Government in either its sovereign or contractual capacity,
- (iii) acts of another Contractor in the performance of a contract with the Government,
- (iv) fires,
- (v) floods,
- (vi) epidemics,
- (vii) quarantine restrictions,
- (viii) strikes,
- (ix) freight embargoes,
- (x) unusually severe weather, or delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and
- (2) The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.
- (c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the Government.

The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

http://www.arnet.gov/far http://farsite.hill.af.mil http://www.dtic.mil/dfars

(End of clause)

52.252-4 ALTERATIONS IN CONTRACT (APR 1984)

Portions of this contract are altered as follows:

N/A

(End of clause)

52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

- (a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.
- (f) The use in this solicitation or contract of any DoD FAR Supplement (48 CFR Chapter 2) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

52.253-1 COMPUTER GENERATED FORMS (JAN 1991)

- (a) Any data required to be submitted on a Standard or Optional Form prescribed by the Federal Acquisition Regulation (FAR) may be submitted on a computer generated version of the form, provided there is no change to the name, content, or sequence of the data elements on the form, and provided the form carries the Standard or Optional Form number and edition date.
- (b) Unless prohibited by agency regulations, any data required to be submitted on an agency unique form prescribed by an agency supplement to the FAR may be submitted on a computer generated version of the form provided there is no change to the name, content, or sequence of the data elements on the form and provided the form carries the agency form number and edition date.

(g) If the Contractor submits a computer generated version of a form that is different than the required form, then the rights and obligations of the parties will be determined based on the content of the required form.

(End of clause)

252,201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)

- (a) "Definition. Contracting officer's representative" means an individual designated in accordance with subsection 201.602-2 of the Defense Federal Acquisition Regulation Supplement and authorized in writing by the contracting officer to perform specific technical or administrative functions.
- (b) If the Contracting Officer designates a contracting officer's representative (COR), the Contractor will receive a copy of the written designation. It will specify the extent of the COR's authority to act on behalf of the contracting officer. The COR is not authorized to make any commitments or changes that will affect price, quality, quantity, delivery, or any other term or condition of the contract.

(End of clause)

252.203-7001 PROHIBITION ON PERSONS CONVICTED OF FRAUD OR OTHER DEFENSE-CONTRACT-RELATED FELONIES (MAR 1999)

- (a) Definitions. As used in this clause—
- (1) "Arising out of a contract with the DoD" means any act in connection with—
- (i) Attempting to obtain;
- (ii) Obtaining, or
- (iii) Performing a contract or first-tier subcontract of any agency, department, or component of the Department of Defense (DoD).
- (2) "Conviction of fraud or any other felony" means any conviction for fraud or a felony in violation of state or Federal criminal statutes, whether entered on a verdict or plea, including a plea of *nolo contendere*, for which sentence has been imposed.
- (3) "Date of conviction" means the date judgment was entered against the individual.
- (b) Any individual who is convicted after September 29, 1988, of fraud or any other felony arising out of a contract with the DoD is prohibited from serving--
- (1) In a management or supervisory capacity on any DoD contract or first-tier subcontract;

- (2) On the board of directors of any DoD contractor or first-tier subcontractor;
- (3) As a consultant, agent, or representative for any DoD contractor or first-tier subcontractor; or
- (4) In any other capacity with the authority to influence, advise, or control the decisions of any DoD contractor or subcontractor with regard to any DoD contract or first-tier subcontract.
- (c) Unless waived, the prohibition in paragraph (b) of this clause applies for not less than 5 years from the date of conviction.
- (d) 10 U.S.C. 2408 provides that a defense contractor or first-tier subcontractor shall be subject to a criminal penalty of not more than \$500,000 if convicted of knowingly—
- (1) Employing a person under a prohibition specified in paragraph (b) of this clause; or
- (2) Allowing such a person to serve on the board of directors of the contractor or first-tier subcontractor.
- (e) In addition to the criminal penalties contained in 10 U.S.C. 2408, the Government may consider other available remedies, such as—
- (1) Suspension or debarment;
- (2) Cancellation of the contract at no cost to the Government; or
- (3) Termination of the contract for default.
- (f) The Contractor may submit written requests for waiver of the prohibition in paragraph (b) of this clause to the Contracting Officer. Requests shall clearly identify—
- (1) The person involved;
- (2) The nature of the conviction and resultant sentence or punishment imposed;
- (3) The reasons for the requested waiver; and
- (4) An explanation of why a waiver is in the interest of national security.
- (g) The Contractor agrees to include the substance of this clause, appropriately modified to reflect the identity and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation, except those for commercial items or components.
- (h) Pursuant to 10 U.S.C. 2408(c), defense contractors and subcontractors may obtain information as to whether a particular person has been convicted of fraud or any other felony arising out of a contract with the DoD by contacting The Office of Justice Programs, The Denial of Federal Benefits Office, U.S. Department of Justice, telephone (202) 616-3507.

252.203-7002 DISPLAY OF DOD HOTLINE POSTER (DEC 1991)

- (a) The Contractor shall display prominently in common work areas within business segments performing work under Department of Defense (DoD) contracts, DoD Hotline Posters prepared by the DoD Office of the Inspector General.
- (b) DoD Hotline Posters may be obtained from the DoD Inspector General, ATTN: Defense Hotline, 400 Army Navy Drive, Washington, DC 22202-2884.
- (h) The Contractor need not comply with paragraph (a) of this clause if it has established a mechanism, such as a hotline, by which employees may report suspected instances of improper conduct, and instructions that encourage employees to make such reports.

(End of clause)

252.204-7003 CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the contractor.

(End of clause)

252,204-7004 REQUIRED CENTRAL CONTRACTOR REGISTRATION (NOV 2001)

(a) Definitions.

As used in this clause--

- (1) Central Contractor Registration (CCR) database means the primary DoD repository for contractor information required for the conduct of business with DoD.
- (2) Data Universal Numbering System (DUNS) number means the 9-digit number assigned by Dun and Bradstreet Information Services to identify unique business entities.
- (3) Data Universal Numbering System +4 (DUNS+4) number means the DUNS number assigned by Dun and Bradstreet plus a 4-digit suffix that may be assigned by a parent (controlling) business concern. This 4-digit suffix may be assigned at the discretion of the parent business concern for such purposes as identifying subunits or affiliates of the parent business concern.

- (4) Registered in the CCR database means that all mandatory information, including the DUNS number or the DUNS+4 number, if applicable, and the corresponding Commercial and Government Entity (CAGE) code, is in the CCR database; the DUNS number and the CAGE code have been validated; and all edits have been successfully completed.
- (b)(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee must be registered in the CCR database prior to award, during performance, and through final payment of any contract resulting from this solicitation, except for awards to foreign vendors for work to be performed outside the United States.
- (2) The offeror shall provide its DUNS or, if applicable, its DUNS+4 number with its offer, which will be used by the Contracting Officer to verify that the offeror is registered in the CCR database.
- (3) Lack of registration in the CCR database will make an offeror ineligible for award.
- (4) DoD has established a goal of registering an applicant in the CCR database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation.
- (c) The Contractor is responsible for the accuracy and completeness of the data within the CCR, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to confirm on an annual basis that its information in the CCR database is accurate and complete.
- (d) Offerors and contractors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423, or via the Internet at http://www.ccr.gov.

252.209-7000 ACQUISITION FROM SUBCONTRACTORS SUBJECT TO ONSITE INSPECTION UNDER THE INTERMEDIATE-RANGE NUCLEAR FORCES (INF) TREATY (NOV 1995)

(a) The Contractor shall not deny consideration for a subcontract award under this contract to a potential subcontractor subject to on-site inspection under the INF Treaty, or a similar treaty, solely or in part because of the actual or potential presence of Soviet inspectors at the subcontractor's facility, unless the decision is approved by the Contracting Officer.

(b) The Contractor shall incorporate this clause, including this paragraph (b), in all solicitations and contracts exceeding the simplified acquisition threshold in part 13 of the Federal Acquisition Regulation, except those for commercial items.

(End of clause)

252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

- (a) Unless the Government determines that there is a compelling reason to do so, the Contractor shall not enter into any subcontract in excess of \$25,000 with a firm, or subsidiary of a firm, that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country.
- (b) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country. The notice must include the name of the proposed subcontractor notwithstanding its inclusion on the List of Parties Excluded From Federal Procurement and Nonprocurement Programs.

(End of clause)

252.219-7003 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DOD CONTRACTS) (APR. 1996)

This clause supplements the Federal Acquisition Regulation 52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, clause of this contract.

(a) *Definitions. Historically black colleges and universities*, as used in this clause, means institutions determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. The term also means any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

Minority institutions, as used in this clause, means institutions meeting the requirements of section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)). The term also includes Hispanic-serving institutions as defined in section 316(b)(1) of such Act (20 U.S.C. 1059c(b)(1)).

- (b) Except for company or division-wide commercial items subcontracting plans, the term *small disadvantaged business*, when used in the FAR 52.219-9 clause, includes historically black colleges and universities and minority institutions, in addition to small disadvantaged business concerns.
- (c) Work under the contract or its subcontracts shall be credited toward meeting the small disadvantaged business concern goal required by paragraph (d) of the FAR 52.219-9 clause when:
- (1) It is performed on Indian lands or in joint venture with an Indian tribe or a tribally-owned corporation, and
- (2) It meets the requirements of 10 U.S.C. 2323a.
- (d) Subcontracts awarded to workshops approved by the Committee for Purchase from People Who are Blind or Severely Disabled (41 U.S.C. 46-48), may be counted toward the Contractor's small business subcontracting goal.
- (e) A mentor firm, under the Pilot Mentor-Protege Program established under Section 831 of Pub. L. 101-510, as amended, may count toward its small disadvantaged business goal, subcontracts awarded--
- (f) The master plan approval referred to in paragraph (f) of the FAR 52.219-9 clause is approval by the Contractor's cognizant contract administration activity.
- (g) In those subcontracting plans which specifically identify small, small disadvantaged, and women-owned small businesses, the Contractor shall notify the Administrative Contracting Officer of any substitutions of firms that are not small, small disadvantaged, or women-owned small businesses for the firms listed in the subcontracting plan. Notifications shall be in writing and shall occur within a reasonable period of time after award of the subcontract. Contractor-specified formats shall be acceptable.

252.223-7001 HAZARD WARNING LABELS (DEC 1991)

- (a) "Hazardous material," as used in this clause, is defined in the Hazardous Material Identification and Material Safety Data clause of this contract.
- (b) The Contractor shall label the item package (unit container) of any hazardous material to be delivered under this contract in accordance with the Hazard Communication Standard (29 CFR 1910.1200 et seq). The Standard requires that the hazard warning label conform to the

requirements of the standard unless the material is otherwise subject to the labeling requirements of one of the following statutes:

- (1) Federal Insecticide, Fungicide and Rodenticide Act;
- (2) Federal Food, Drug and Cosmetics Act;
- (3) Consumer Product Safety Act;
- (4) Federal Hazardous Substances Act; or
- (5) Federal Alcohol Administration Act.
- (c) The Offeror shall list which hazardous material listed in the Hazardous Material Identification and Material Safety Data clause of this contract will be labeled in accordance with one of the Acts in paragraphs (b)(1) through
- (5) of this clause instead of the Hazard Communication Standard. Any hazardous material not listed will be interpreted to mean that a label is required in accordance with the Hazard Communication Standard.

MATERIAL (If None, Insert "None.")	

- (d) The apparently successful Offeror agrees to submit, before award, a copy of the hazard warning label for all hazardous materials not listed in paragraph (c) of this clause. The Offeror shall submit the label with the Material Safety Data Sheet being furnished under the Hazardous Material Identification and Material Safety Data clause of this contract.
- (e) The Contractor shall also comply with MIL-STD-129, Marking for Shipment and Storage (including revisions adopted during the term of this contract).

(End of clause)

252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)

- (a) Definitions.
- (1) "Employee in a sensitive position," as used in this clause, means an employee who has been granted access to classified information; or employees in other positions that the Contractor determines involve national security; health or safety, or functions other than the foregoing requiring a high degree of trust and confidence.

- (2) "Illegal drugs," as used in this clause, means controlled substances included in Schedules I and II, as defined by section 802(6) of title 21 of the United States Code, the possession of which is unlawful under chapter 13 of that Title. The term "illegal drugs" does not mean the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.
- (b) The Contractor agrees to institute and maintain a program for achieving the objective of a drug-free work force. While this clause defines criteria for such a program, contractors are encouraged to implement alternative approaches comparable to the criteria in paragraph (c) that are designed to achieve the objectives of this clause.
- (c) Contractor programs shall include the following, or appropriate alternatives:
- (1) Employee assistance programs emphasizing high level direction, education, counseling, rehabilitation, and coordination with available community resources;
- (2) Supervisory training to assist in identifying and addressing illegal drug use by Contractor employees;
- (3) Provision for self-referrals as well as supervisory referrals to treatment with maximum respect for individual confidentiality consistent with safety and security issues;
- (4) Provision for identifying illegal drug users, including testing on a controlled and carefully monitored basis. Employee drug testing programs shall be established taking account of the following:
- (i) The Contractor shall establish a program that provides for testing for the use of illegal drugs by employees in sensitive positions. The extent of and criteria for such testing shall be determined by the Contractor based on considerations that include the nature of the work being performed under the contract, the employee's duties, and efficient use of Contractor resources, and the risks to health, safety, or national security that could result from the failure of an employee adequately to discharge his or her position.
- (ii) In addition, the Contractor may establish a program for employee drug testing-
- (A) When there is a reasonable suspicion that an employee uses illegal drugs; or
- (B) When an employees has been involved in an accident or unsafe practice;
- (C) As part of or as a follow-up to counseling or rehabilitation for illegal drug use;
- (D) As part of a voluntary employee drug testing program.
- (iii) The Contractor may establish a program to test applicants for employment for illegal drug use.

- (iv) For the purpose of administering this clause, testing for illegal drugs may be limited to those substances for which testing is prescribed by section 2..1 of subpart B of the "Mandatory Guidelines for Federal Workplace Drug Testing Programs" (53 FR 11980 (April 11, 1988), issued by the Department of Health and Human Services.
- (d) Contractors shall adopt appropriate personnel procedures to deal with employees who are found to be using drugs illegally. Contractors shall not allow any employee to remain on duty or perform in a sensitive position who is found to use illegal drugs until such times as the Contractor, in accordance with procedures established by the Contractor, determines that the employee may perform in such a position.
- (e) The provisions of this clause pertaining to drug testing program shall not apply to the extent that are inconsistent with state or local law, or with an existing collective bargaining agreement; provided that with respect to the latter, the Contractor agrees those issues that are in conflict will be a subject of negotiation at the next collective bargaining session.

252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)

- (a) Definitions. As used in this clause--
- (1) "Foreign person" means any person other than a United States person as defined in Section 16(2) of the Export Administration Act of 1979 (50 U.S.C. App. Sec 2415).
- (2) "United States person" is defined in Section 16(2) of the Export Administration Act of 1979 and means any United States resident or national (other than an individual resident outside the United States and employed by other than a United States person), any domestic concern (including any permanent domestic establishment of any foreign concern), and any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern which is controlled in fact by such domestic concerns, as determined under regulations of the President.
- (b) Certification. By submitting this offer, the Offeror, if a foreign person, company or entity, certifies that it--
- (1) Does not comply with the Secondary Arab Boycott of Israel; and
- (2) Is not taking or knowingly agreeing to take any action, with respect to the Secondary Boycott of Israel by Arab countries, which 50 U.S.C. App. Sec 2407(a) prohibits a United States person from taking.

(End of clause)

252.225-7036 BUY AMERICAN ACT--NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT--BALANCE OF PAYMENTS PROGRAM (MAR 1998) - ALTERNATE I (SEP 1999)

- (a) Definitions. As used in this clause—
- (1) "Components" means those articles, materials, and supplies directly incorporated into end products.
- (2) "Domestic end product" means—
- (i) An unmanufactured end product that has been mined or produced in the United States; or
- (ii) An end product manufactured in the United States if the cost of its qualifying country components and its components that are mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. The cost of components shall include transportation costs to the place of incorporation into the end product and U.S. duty (whether or not a duty-free entry certificate may be issued). A component shall be considered to have been mined, produced, or manufactured in the United States (regardless of its source in fact) if the end product in which it is incorporated is manufactured in the United States and the component is of a class or kind—
- (A) Determined to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality; or
- (B) That the Secretary concerned determines would be inconsistent with the public interest to apply the restrictions of the Buy American Act.
- (3) "End product" means those articles, materials, and supplies to be acquired for public use under the contract. For this contract, the end products are the line items to be delivered to the Government (including supplies to be acquired by the Government for public use in connection with service contracts, but excluding installation and other services to be performed after delivery).
- (4) "Foreign end product" means an end product other than a domestic end product.
- (5) "North American Free Trade Agreement (NAFTA) country" means Canada or Mexico.
- (6) "Canadian end product," means an article that—
- (i) Is wholly the growth, product, or manufacture of Canada; or
- (ii) In the case of an article that consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in Canada into a new and different article of commerce with a name, character, or use distinct from that of the article or articles from which it so was so transformed. The term refers to a product offered for purchase under a supply contract, but for purposes of calculating the value of the end product includes services (except transportation services) incidental to its supply, provided that the value of those incidental services does not exceed that of the product itself.

- (c) The Contractor agrees to deliver under this contract only domestic end products unless, in its offer, it specified delivery of qualifying country, Canadian, or other foreign end products in the Buy American Act--North American Free Trade Agreement Implementation Act--Balance of Payments Program Certificate provision of the solicitation. An offer certifying that a qualifying country end product or a Canadian end product will be supplied requires the Contractor to supply a qualifying country end product or a Canadian end product, whichever is certified, or, at the Contractor's option, a domestic end product.
- (d) The offered price of qualifying country end products, or Canadian end products for line items subject to the North American Free Trade Agreement Implementation Act, should not include custom fees or duty. The offered price of foreign end products listed in paragraph (c)(2)(iii) of the Buy American Act--North American Free Trade Agreement Implementation Act--Balance of Payments Program Certificate provision of the solicitation, or the offered price of domestic end products that contain nonqualifying country components, must include all applicable duty. The award price will not include duty for end products or components that are to be accorded duty-free entry. Generally, each foreign end product listed in paragraph (c)(2)(iii) of the Buy American Act--North American Free Trade Agreement Implementation Act--Balance of Payments Program Certificate provision of the solicitation is adjusted for the purpose of evaluation by adding 50 percent of the offered price, inclusive of duty.
- (7) "Qualifying country" means any country set forth in subsection 225.872-1 of the Defense Federal Acquisition Regulation Supplement.
- (8) "Qualifying country component" means an item mined, produced, or manufactured in a qualifying country.
- (9) "Qualifying country end product" means—
- (i) An unmanufactured end product mined or produced in a qualifying country; or
- (ii) An end product manufactured in a qualifying country if the cost of the components mined, produced, or manufactured in the qualifying country and its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components.
- (b) Unless otherwise specified, the North American Free Trade Agreement Implementation Act of 1993 (19 U.S.C. 3301 note) applies to all items in the Schedule.
- (c) The Contractor agrees to deliver under this contract only domestic end products unless, in its offer, it specified delivery of qualifying country, NAFTA country, or other foreign end products in the Buy American Act--North American Free Trade Agreement Implementation Act--Balance of Payments Program Certificate provision of the solicitation. An offer certifying that a qualifying country end product or a NAFTA country end product will be supplied requires the Contractor to supply a qualifying country end product or a NAFTA country end product, whichever is certified, or, at the Contractor's option, a domestic end product.
- (d) The offered price of qualifying country end products, or NAFTA country end products for line items subject to the North American Free Trade Agreement Implementation Act, should not include custom fees or duty. The offered price of foreign end products listed in paragraph (c)(2)(iii) of the Buy American Act--North American Free Trade Agreement Implementation Act--Balance of Payments Program Certificate provision of the solicitation, or the offered price of domestic end products that contain nonqualifying country components, must include all applicable duty. The award price will not include duty for end products or components that are to be accorded duty-free entry. Generally, each foreign end product listed in paragraph (c)(2)(iii) of the Buy American Act--North American Free Trade Agreement Implementation Act--Balance of

Payments Program Certificate provision of the solicitation is adjusted for the purpose of evaluation by adding 50 percent of the offered price, inclusive of duty.

(End of clause)

252.227-7033 RIGHTS IN SHOP DRAWINGS (APR 1966)

- (a) Shop drawings for construction means drawings, submitted to the Government by the Construction Contractor, subcontractor or any lower-tier subcontractor pursuant to a construction contract, showing in detail (i) the proposed fabrication and assembly of structural elements and (ii) the installation (i.e., form, fit, and attachment details) of materials or equipment. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.
- (b) This clause, including this paragraph (b), shall be included in all subcontracts hereunder at any tier.

252.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)

When the allowability of costs under this contract is determined in accordance with part 31 of the Federal Acquisition Regulation (FAR), allowability shall also be determined in accordance with part 231 of the Defense FAR Supplement, in effect on the date of this contract.

(End of clause)

252.236-7000 MODIFICATION PROPOSALS - PRICE BREAKDOWN. (DEC 1991)

(a)	The C	Contrac	tor shal	l furnish	a price	break	down,	itemized	as requi	ired and	d within	the	time
spe	cified	l by the	Contra	cting Of	ficer, w	ith an	y prop	osal for a	contract	modif	ication.		

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- (i) Material;
- (ii) Labor;
- (iii) Equipment;
- (iv) Subcontracts; and

- (v) Overhead; and
- (2) Must cover all work involved in the modification, whether the work was deleted, added, or changed.
- (c) The Contractor shall provide similar price breakdowns to support any amounts claimed for subcontracts.
- (d) The Contractor's proposal shall include a justification for any time extension proposed.

252.236-7008 CONTRACT PRICES - BIDDING SCHEDULES. (DEC 1991)

- (a) The Government's payment for the items listed in the Bidding Schedule shall constitute full compensation to the Contractor for --
- (1) Furnishing all plant, labor, equipment, appliances, and materials; and
- (2) Performing all operations required to complete the work in conformity with the drawings and specifications.
- (b) The Contractor shall include in the prices for the items listed in the Bidding Schedule all costs for work in the specifications, whether or not specifically listed in the Bidding Schedule.

252.243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

When costs are a factor in any price adjustment under this contract, the contract cost principles and procedures in FAR part 31 and DFARS part 231, in effect on the date of this contract, apply.

252.244-7000 SUBCONTRACTS FOR COMMERCIAL ITEMS AND COMMERCIAL COMPONENTS (DOD) (MAR 2000)

In addition to the clauses listed in paragraph (c) of the Subcontracts for Commercial Items and Commercial Components clause of this contract (Federal Acquisition Regulation 52.244-6), the Contractor shall include the terms of the following clauses, if applicable, in subcontracts for commercial items or commercial components, awarded at any tier under this contract:

- 252.225-7014 Preference for Domestic Specialty Metals, Alternate I (10 U.S.C. 2241 note).
- 252.247-7023 Transportation of Supplies by Sea (10 U.S.C. 2631).
- 252.247-7024 Notification of Transportation of Supplies by Sea (10 U.S.C. 2631).

252.245-7001 REPORTS OF GOVERNMENT PROPERTY (MAY 1994)

- (a) The Contractor shall provide an annual report --
- (1) For all DoD property for which the Contractor is accountable under the contract;
- (2) Prepared in accordance with the requirements of DD Form 1662, DoD Property in the Custody of Contractors, or approved substitute, including instructions on the reverse side of the form:
- (3) In duplicate, to the cognizant Government property administrator, no later than October 31.
- (b) The Contractor is responsible for reporting all Government property accountable to this contract, including that at subcontractor and alternate locations.

(End of clause)

252.246-7000 MATERIAL INSPECTION AND RECEIVING REPORT (DEC 1991)

At the time of each delivery of supplies or services under this contract, the Contractor shall prepare and furnish to the Government a Material Inspection and Receiving Report in the manner and to the extent required by Appendix F, Material Inspection and Receiving Report, of the Defense FAR Supplement.

(End of clause)

252.247-7023 TRANSPORTATION OF SUPPLIES BY SEA (MAY 2002)

- (a) Definitions. As used in this clause --
- (1) "Components" means articles, materials, and supplies incorporated directly into end products at any level of manufacture, fabrication, or assembly by the Contractor or any subcontractor.
- (2) "Department of Defense" (DoD) means the Army, Navy, Air Force, Marine Corps, and defense agencies.
- (3) "Foreign flag vessel" means any vessel that is not a U.S.-flag vessel.

- (4) "Ocean transportation" means any transportation aboard a ship, vessel, boat, barge, or ferry through international waters.
- (5) "Subcontractor" means a supplier, materialman, distributor, or vendor at any level below the prime contractor whose contractual obligation to perform results from, or is conditioned upon, award of the prime contract and who is performing any part of the work or other requirement of the prime contract.
- (6) "Supplies" means all property, except land and interests in land, that is clearly identifiable for eventual use by or owned by the DoD at the time of transportation by sea.
- (i) An item is clearly identifiable for eventual use by the DoD if, for example, the contract documentation contains a reference to a DoD contract number or a military destination.
- (ii) "Supplies" includes (but is not limited to) public works; buildings and facilities; ships; floating equipment and vessels of every character, type, and description, with parts, subassemblies, accessories, and equipment; machine tools; material; equipment; stores of all kinds; end items; construction materials; and components of the foregoing.
- (7) "U.S.-flag vessel" means a vessel of the United States or belonging to the United States, including any vessel registered or having national status under the laws of the United States.
- (b)(1) The Contractor shall use U.S.-flag vessels when transporting any supplies by sea under this contract.
- (2) A subcontractor transporting supplies by sea under this contract shall use U.S.-flag vessels if-
- (i) This contract is a construction contract; or
- (ii) The supplies being transported are--
- (A) Noncommercial items; or
- (B) Commercial items that--
- (1) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it contracts for f.o.b. destination shipment);
- (2) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or
- (3) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.

- (c) The Contractor and its subcontractors may request that the Contracting Officer authorize shipment in foreign-flag vessels, or designate available U.S.-flag vessels, if the Contractor or a subcontractor believes that --
- (1) U.S.-flag vessels are not available for timely shipment;
- (2) The freight charges are inordinately excessive or unreasonable; or
- (3) Freight charges are higher than charges to private persons for transportation of like goods.
- (d) The Contractor must submit any request for use of other than U.S.-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. The Contracting Officer will process requests submitted after such date(s) as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay under this or any other clause of this contract. Requests shall contain at a minimum --
- (1) Type, weight, and cube of cargo;
- (2) Required shipping date;
- (3) Special handling and discharge requirements;
- (4) Loading and discharge points;
- (5) Name of shipper and consignee;
- (6) Prime contract number; and
- (7) A documented description of efforts made to secure U.S.-flag vessels, including points of contact (with names and telephone numbers) with at least two U.S.-flag carriers contacted. Copies of telephone notes, telegraphic and facsimile message or letters will be sufficient for this purpose.
- (e) The Contractor shall, within 30 days after each shipment covered by this clause, provide the Contracting Officer and the Maritime Administration, Office of Cargo Preference, U.S. Department of Transportation, 400 Seventh Street SW., Washington, DC 20590, one copy of the rated on board vessel operating carrier's ocean bill of lading, which shall contain the following information:
- (1) Prime contract number;
- (2) Name of vessel;

(3) Vessel flag of registry;							
(4) Date of loading;							
(5) Port of loading;							
(6) Port of final discharge;							
(7) Description of commodity;							
(8) Gross weight in pounds and cubic feet if available;							
(9) Total ocean freight in U.S. dollars; and							
(10) Name of the steamship company.							
(f) The Contractor shall provide with its final invoice under this contract a representation that to the best of its knowledge and belief							
(1) No ocean transportation was used in the performance of this contract;							
(2) Ocean transportation was used and only U.Sflag vessels were used for all ocean shipments under the contract;							
(3) Ocean transportation was used, and the Contractor had the written consent of the Contracting Officer for all non-U.Sflag ocean transportation; or							
(4) Ocean transportation was used and some or all of the shipments were made on non-U.Sflag vessels without the written consent of the Contracting Officer. The Contractor shall describe these shipments in the following format:							
ITEM CONTRACT QUANTITY DESCRIPTION LINE ITEMS							
TOTAL							

(g) If the final invoice does not include the required representation, the Government will reject and return it to the Contractor as an improper invoice for the purposes of the Prompt Payment clause of this contract. In the event there has been unauthorized use of non-U.S.-flag vessels in the performance of this contract, the Contracting Officer is entitled to equitably adjust the contract, based on the unauthorized use.

- (h) In the award of subcontracts for the types of supplies described in paragraph (b)(2) of this clause, the Contractor shall flow down the requirements of this clause as follows:
- (1) The Contractor shall insert the substance of this clause, including this paragraph (h), in subcontracts that exceed the simplified acquisition threshold in part 2 of the Federal Acquisition Regulation.
- (2) The Contractor shall insert the substance of paragraphs (a) through (e) of this clause, and this paragraph (h), in subcontracts that are at or below the simplified acquisition threshold in part 2 of the Federal Acquisition Regulation.

252.247-7024 NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)

- (a) The Contractor has indicated by the response to the solicitation provision, Representation of Extent of Transportation by Sea, that it did not anticipate transporting by sea any supplies. If, however, after the award of this contract, the Contractor learns that supplies, as defined in the Transportation of Supplies by Sea clause of this contract, will be transported by sea, the Contractor --
- (1) Shall notify the Contracting Officer of that fact; and
- (2) Hereby agrees to comply with all the terms and conditions of the Transportation of Supplies by Sea clause of this contract.
- (b) The Contractor shall include this clause; including this paragraph (b), revised as necessary to reflect the relationship of the contracting parties--
- (1) In all subcontracts under this contract, if this contract is a construction contract; or
- (2) If this contract is not a construction contract, in all subcontracts under this contract that are for--
- (i) Noncommercial items; or
- (ii) Commercial items that--
- (A) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it subcontracts for f.o.b. destination shipment);

- (B) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or
- (C) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.

(End of clause)

END OF SECTION 00700

PHASE 1-A SHORT FORK WASTE WATER TREATMENT FACILITY DESOTO COUNTY REGIONAL UTILITY AUTHORITY DESOTO COUNTY, MISSISSIPPI

SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

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DESOTO COUNTY REGIONAL UTILITY AUTHORITY DESOTO COUNTY, MISSISSIPPI

SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

1.1 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984). The Contractor shall be required to (a) commence work under this contract within 5 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work, inclusive of all optional bid items, ready for use not later than 510 calendar days after the date of receipt by him of notice to proceed. The time stated for completion shall include final cleanup of the premises. (FAR 52.211-10)

1.2 NOT USED

1.3 LIQUIDATED DAMAGES -CONSTRUCTION (SEP 2000).

- a. If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of, \$1635.00 for each calendar day of delay until the work is completed or accepted.
- b. If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

1.4 NOT USED

1.5 CONTRACT DRAWINGS AND SPECIFICATIONS (AUG 2000).

- a. The Government will provide to the Contractor, without charge one set of contract drawings and specifications, except publications incorporated into the technical provisions by reference, in electronic or paper media as chosen by the Contracting Officer.
 - b. The Contractor shall:
- (1) Check all drawings immediately upon receipt;
- (2) Compare all drawings and verify the figures before laying Out the work;
- (3) Promptly notify the Contracting Officer of any discrepancies;
- (4) Be responsible for any errors that might have been avoided by complying with this paragraph b; and
- (5) Reproduce and print contract drawings and specifications as needed.

c. In general:

- (1) Large-scale drawings shall govern small-scale drawings; and
- (2) The Contractor shall follow figures marked on drawings in preference to scale measurements.
- d. Omissions from the drawings or specifications or the misdescription of details of work that are manifestly necessary to carry out the intent of the drawings and specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work. The Contractor shall perform as if fully and correctly set forth and described in the drawings and specifications.
- e. The work shall conform to the specifications and the contract drawings identified on the following index of drawings:

SHORT FORK WASTEWATER TREATMENT FACILITY

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- 1.6 <u>PHYSICAL DATA (APR 1984).</u> Data and information furnished or referred to below are for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.
- a. . <u>Physical Conditions</u> The indications of physical conditions on the drawings and in the specifications are the result of site investigations by aerial photographs and topographic surveys.
- b. <u>Weather Conditions.</u> Information with respect to temperatures and precipitation may be obtained from the National Weather Service. Also see paragraph 1.28, "Time Extensions for Unusually Severe Weather".
- c. <u>Additional Data.</u> Additional data consisting of cross sections, river stage records, may be available for inspection at the U.S. Army Engineer District, Memphis, Tennessee. (FAR 52.236-4)
- d. Geotechnical Report . The Report of Geotechnical Investigation for Short Fork Creek Wastewater Treatment Facility prepared by Aquaterra Engineering, LLC dated August 24, 2002 is included for information only and is not considerd a part of these specifications. The Government shall not be responsible for any interpretation of or conclusion drawn from the data by the Contractor.

1.7 RIGHTS-OF-WAY.

a. The rights-of-way and easements for the work to be constructed under this contract within the limits indicated on the drawings will be provided by the Government without cost to the Contractor. However, the Contractor shall make his own arrangements with the appropriate owners or organizations for transporting his equipment across, over or under railroad tracks, highways, bridges, private property, and utility lines and shall provide at his own expense any additional right-of-way or easements required to effect such crossings, including insurance requirements of owners. Limits of right-of-way which will be provided by the Government are as indicated on the drawings.

- b. The Contractor shall, upon reasonable notice, without expense to the Government and at any time during the progress of the work when not being actively used for contract operations, promptly vacate and clean up any part of the Government grounds that have been allotted to or have been in use by him when directed to do so by the Contracting Officer.
- c. The Contractor shall not obstruct any existing roads on the lands controlled by the United States except with the permission of the Contracting Officer, and shall maintain such roads in as good condition as exists at the time of commencement of the work.
- d. Any additional right-of-way required for access or for the Contractor's method of operation must be obtained by and at the expense of the Contractor. The Contractor shall submit written evidence to the Contracting Officer that he has obtained the rights-of-way from the property owners. The written evidence shall consist of an authenticated copy of the conveyance under which the Contractor acquired the rights-of-way, prepared and executed in accordance with the laws of the State of Mississippi. If temporary rights are obtained by the Contractor, the period of time shall coincide with paragraph 1.1, "Commencement, Prosecution, and Completion of Work", of the SPECIAL CONTRACT REQUIREMENTS, plus a reasonable time for any extension granted for 00800-3 completion of the work. The Contractor shall be solely responsible for any and all damages, claims for damages, and liability of any nature whatsoever arising from or growing out of the use of rights-of-way other than those rights-of-way furnished by the Government.
- c. The Contractor shall repair, at his own expense, any and all damage to the existing roads when such damage is a result of his operations on this contract. The Contractor shall also replace, at his own expense, any and all surfacing displaced or damaged by his operations on this contract. The repairs and/or replacement shall be done to the satisfaction of the Contracting Officer.

1.8 LAYOUT OF WORK.

- a. The Government will establish the following baselines/controls and bench marks at the site of the work:
 - (1) Baselines/controls as shown on the drawings.
 - (2) Bench marks as shown on the drawings.
- b. From the baselines/controls and bench marks established by the Government, the Contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.
- c. The Contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and materials, and all labor as may be required in laying out any part of the work from the baselines and bench marks established by the Government. It shall be the responsibility of the Contractor to maintain and preserve all stakes and marks established

by the Contracting Officer until authorized to remove them, and if such marks are destroyed, by the Contractor or through his negligence, prior to their authorized removal, they may be replaced by the Contracting Officer, at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the Contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.

1.9 NOT USED

1.10 QUANTITY SURVEYS-ALTERNATE I (APR 1984).

- a. Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.
- b. The Contractor shall conduct the original and final surveys for any periods for which progress payments are requested. All these surveys shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement. The Government shall make such computations as are necessary to determine the quantities of work performed or finally in place. The Contractor shall make the computations based on the surveys for any periods for which progress payments are requested.
- c. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes, raw data files, coordinate data files and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer. (FAR 52.236-16)
- d. Quantity surveys as used in this clause means a topographical survey accomplished by ground methods requiring the use of a total station instrument with the display output recorded and stored in an electronic field book for further calculations in a computer. The Contractor shall furnish the electronic data in an Intergraph or PacSoft format to the Contracting Officer.
- e. <u>Quantity Survey Method</u>. The cross-section method shall be used to obtain topography. Cross-section spacing will depend upon the terrain but shall not exceed 100 feet. All breaks in slope shall be recorded along the cross-section with a maximum distance 25 feet between observations.
- f. <u>Quantity Survey Limits.</u> After clearing of vegetation and trees, the topographic survey shall extend to 50 feet beyond the limits of work or to the Right-of-Way limits as shown on the drawings.
- 1.11 PROGRESS CHART. The schedule of work will be in accordance with the progress chart. The progress chart required by provisions of paragraph (a) of the CONTRACT CLAUSE entitled "Schedules for Construction Contracts" shall be prepared on ENG Form 2454, copies of which will be furnished to the Contractor by the Government. THREE COPIES OF THE SCHEDULE WILL BE REQUIRED.

- 1.12 <u>SAFETY-RELATED SPECIAL REQUIREMENTS.</u> ALL WORK UNDER THIS CONTRACT SHALL COMPLY WITH THE LATEST VERSION OF U.S. ARMY CORPS OF ENGINEERS SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, AND OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) STANDARDS IN EFFECT ON THE DATE OF THE SOLICITATION. NO SEPARATE PAYMENT WILL BE MADE FOR COMPLIANCE WITH EM 385-1-1, NOR FOR COMPLIANCE WITH ANY OF THE OTHER SAFETY RELATED SPECIAL REQUIREMENTS.
- a. <u>Accident Investigations and Reporting</u>. Refer to EM 385-1-1, Section 1. Accidents shall be investigated and reports completed by the immediate supervisor of the employee(s) involved and reported to the Contracting Officer or his representative within one working day after the accident occurs. Copies of ENG FORM 3394 will be furnished the Contractor upon request by the Area Office.
- b. <u>Accident Prevention Program.</u> Refer to the CONTRACT CLAUSE entitled, "Accident Prevention (Alternate 1)". Within 21 calendar days after receipt of Notice of Award of the contract, four copies of the Accident Prevention Program shall be submitted to the Contracting Officer for review and approval. The program shall be prepared in the following format:
- (1) An executed LMV Form 358R, Administrative Plan (available upon request).
- (2) An executed LMV Form 359R, Activity Hazard Analysis (available upon request).
 - (3) A copy of company policy statement regarding accident prevention.
- (4) When marine plant and equipment are in use under a contract, the method of fuel oil transfer shall be submitted on LMV Form 414R, Fuel Oil Transfer, (available upon request). (Refer to 33 CFR 156.)

The Contractor shall not commence physical work at the site until the program has been approved by the Contracting Officer, or his authorized representative. At the Contracting Officer's discretion, the Contractor may submit his Activity Hazard Analysis for only the first phase of construction provided that it is accompanied by an outline of the remaining phases of construction. All remaining phases shall be submitted and accepted prior to the beginning of work in each phase. Also refer to Section I of EM 3 85-1-1.

- c. <u>Daily Inspections</u>. The Contractor shall perform daily safety inspections and record them on the forms approved by the Contracting Officer. Reports of daily inspections shall be maintained at the jobsite. The reports shall be records of the daily inspections and resulting actions. Each report will include, as a minimum, the following:
 - (1) Phase(s) of construction underway during the inspection.
 - (2) Locations or areas inspections were made.

- (3) Results of inspection, including nature of deficiencies observed and corrective actions taken, or to be taken, date, and signature of the person responsible for its contents.
- d. <u>Machinery and Mechanized Equipment.</u> Machinery and mechanized equipment used under this contract shall comply with the following:
- (1) When mechanized equipment is operated on floating plant, the Contractor shall provide positive and acceptable means of preventing this equipment from moving or falling into the water. The type of equipment addressed by this clause includes front-end loaders, bulldozers, trucks (both on and off-road), backhoes, track hoes, and similar equipment. If the Contractor plans to use such equipment on floating plant, an activity hazard analysis must be developed for this feature of work. The plan must include a detailed explanation of the type or types of physical barriers, curbs, structures, etc., which will be incorporated to protect the operator and prevent the equipment from entering the water. Nonstructural warning devices may be considered for situations where the use of structural barriers is determined to be impracticable. The activity hazard analysis must thoroughly address the procedure and be submitted to the Corps for review and acceptance prior to start of this feature of work.
- (2) The stability of crawler, truck, and wheel-mounted cranes shall be assured.
- (a) The manufacturer's load-rating chart may be used to determine the maximum allowable working load for each particular crane's boom angle provided a test load, with a boom angle of 20 degrees, confirms the manufacturer's load-rating table.
 - (b) Stability tests are required if.
 - (1) There is no manufacturer's load-rating chart securely fixed to the operator's cab;
 - (11) There has been a change in the boom or other structural members; or
 - (111) There has been a change in the counterweight.

The test shall consist of lifting a load with the boom in the least stable undercarriage position and at an angle of 20 degrees above the horizontal. The test shall be conducted tinder close supervision on a firm, level surface. The load that tilts the machine shall be identified as the test load. The test load moment (in ft-lbs) shall then be calculated by multiplying the horizontal distance (in ft) from the center of rotation of the machine to the test load, times the test load (in lbs). Three-fourths of this test-load moment shall then be used to compute the maximum allowable operating loads for the boom at 20, 40, 60, and 80 degrees above horizontal. From these maximum allowable operating loads, a curve shall be plotted and posted in the cab of the machine in sight of the operator. These values shall not be exceeded except in the performance test described below. The test load shall never exceed I 10 percent of the manufacturer's maximum rated capacity.

(c) In lieu of the test and computations above, the crane may be load tested for stability at each of the four boom positions listed above.

- (3) Performance tests shall be performed in accordance with Section 16 of EM 385-1-1. Performance tests shall be conducted after each stability test, when the crane is placed in service on a project, and at least every 12 months.
- (4) Inspections shall be made which will ensure a safe and economical operation of both cranes and draglines. Specific inspections and their frequencies are listed on the appropriate checklists noted below. Results of inspections and tests for cranes shall be recorded on the Safety Inspection Check List, LMV Form 326R (available upon request), and inspection results for draglines shall be recorded on LMV Form 373R (available upon request). Copies of the inspections and **tests shall be available at the jobsite** for review. All stability and performance tests on cranes and all complete dragline inspections shall be witnessed by the Contracting Officer or his authorized representative.
- (5) A complete dragline inspection shall be made:
 - (a) At least annually;
 - (b) Prior to the dragline being placed in operation; and
 - (c) After the dragline has been out of service for more than six months.
- d. <u>Safety Sign.</u> The Contractor shall furnish, erect, and maintain a safety sign at the site, as located by the Contracting Officer. The sign shall conform to the requirements of this paragraph and the drawing entitled "Safety Sign", included at the end of these Special Contract Requirements. The lettering shall be black and the background white. When placed on floating plant, the sign may be half size. Upon request, the Government will furnish a decal of the Engineer Castle. The sign shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The data required shall be current.
- 1.13 <u>BASIS FOR SETTLEMENT OF PROPOSALS (JAN 1997)</u>. Actual costs will be used to determine equipment costs for a settlement proposal submitted on the total cost basis under FAR 49.206-2(b). In evaluating a terminations settlement proposal using the total cost basis, the 00800-9 following principles will be applied to determine allowable equipment costs:
- (1) Actual costs for each piece of equipment, or groups of similar serial or series equipment, need not be available in the Contractor's accounting records to determine total actual equipment costs.
- (2) If equipment costs have been allocated to a contract using predetermined rates, those charges will be adjusted to actual costs.
- (3) Recorded job costs adjusted for unallowable expenses will be used to determine equipment operating expenses.
- (4) Ownership costs (depreciation) will be determined using the Contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).

- (5) License, taxes, storage and insurance costs are normally recovered as an indirect expense and unless the Contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate. (EFARS 52.249-5000)
- 1.14 <u>CERTIFICATES OF COMPLIANCE</u>. Any certificates required for demonstrating proof of compliance of material with specification requirements shall be executed in four (4) copies. Each certificate shall be signed by an official authorized to certify on behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the test to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.
- 1.15 <u>CONTRACTOR'S CERTIFICATE</u>. Each submittal of shop drawings and materials data shall be accompanied by a certificate, signed by the head of the Quality Control Organization of the prime Contractor, that the prime Contractor has reviewed in detail all shop drawings and materials contained in the submittal and that they are correct and in strict conformance with the contract drawings and specifications except as may be otherwise explicitly stated. The Government **will first check for the** Contractor's certificate and then review and render approval action or indicate disapproval in those cases where contract requirements are not fulfilled.
- 1.16 SHOP DRAWINGS. The Contractor shall submit to the Contracting Officer for approval 6 copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete and detailed. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The Contractor shall make any correction required by the Contracting Officer. If the Contractor considers any correction indicated on the drawings to constitute a change to the contract drawings or specifications, notice as required under the CONTRACT CLAUSE entitled "Changes", will be given to the Contracting Officer. Five sets of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor. The approval of the drawings by the Contracting Officer shall not be construct as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.
- 1.17 AS-BUILT DRAWINGS. The Contractor shall maintain two (2) full-size sets of the Contract drawings depicting a current record of the work as actually constructed. One set is for the Contractor's use and one for the Government's use. These working as-built drawing red-line mark-ups may be manually or electronically generated using the construction plans. These working as-built drawings shall be reviewed at least monthly with the Contracting Officer, prior to the Contractor submitting a request for progress payment. Both shall certify that the as-built drawings are accurate and up-to-date before progress payment is made. Upon completion of the work and not later than 60 days from acceptance, the Contractor shall deliver a complete final set of the as-built red-line marked-up plans depicting the construction as actually accomplished. The final as-built drawings shall be identified as such by marking or

stamping them with the words "AS-BUILT DRAWINGS" in letters at least 3/16" high. Those drawings where no change is involved shall be marked or stamped "AS-BUILT, NO CHANGE". Compliance and delivery of the final as-built drawings will be enforced through the approval of final payment. Also, the quality of the final as-built drawings will be reflected in the Contractor's performance evaluation.

- 1.18 <u>DAMAGE TO WORK.</u> The responsibility for damage to any part of the permanent work shall be as set forth in the CONTRACT CLAUSE entitled "Permits and Responsibilities". However, if, in the judgment of the Contracting Officer, any part of the permanent work performed J 12, by the Contractor is damaged by flood, tornado, or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor shall make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work, an equitable adjustment pursuant to the CONTRACT CLAUSE entitled "Changes" will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of **the Contracting Officer** at the Contractor's expense regardless of the cause of such damage.
- 1.19 NOTIFICATION OF AREA ENGINEER BEFORE BEGINNING WORK. At least 7 days before beginning work, the Contractor shall notify Mr. Donald R. Tutor, Area Engineer, Wynne Area Office, 1932 N. Falls Boulevard, P.O. Box 729, Wynne, Arkansas 72396-0729, 00800-11 Telephone No. 901-544-3856 or 870-238-7983. COLLECT CALLS WILL NOT BE ACCEPTED.

1.20 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAR1995)

- a. This clause does not apply to terminations. See SPECIAL CONTRACT REQUIREMENT entitled, "Basis for Settlement of Proposals" and FAR Part 49.
- b. Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the Contractor's accounting records. When both ownership and operating, costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the Contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP I 110- 1 -8, Construction Equipment Ownership and Operating Expense Schedule, Region Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

- c. Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(2)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.
- d. When actual equipment costs are proposed and the total armount of the pricing action exceeds the small purchase threshold, the Contracting Officer shall request the Contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. (EFARS 52.23 1 -5000)

NOTE: THE CONTRACTOR MAY PURCHASE THE EQUIPMENT MANUAL FROM THE GOVERNMENT PRINTING OFFICE. THE GOVERNMENT PRINTING OFFICE TELEPHONE NO. IS 202-512-1800 and THE INTERNET ADDRESS IS http://www.pls.com:8001/liis/cfr.html.

- 1.21 <u>RETESTING OF CONSTRUCTION MATERIALS</u>. Unless otherwise specified, where the Technical Specifications state that tests will be performed at the expense of the Government, the cost of only the initial test will be bome by the Government. Any retesting due to failure of the materials to meet the requirements in the initial test or any retesting requested by the Contractor shall be performed at the Contractor's expense. The retests shall be at laboratories approved by the Contracting Officer. The costs of retests made at Government laboratories will be deducted from the total amount due the Contractor.
- 1.22 <u>VEHICLE WEIGHT LIMITATIONS</u>. Vehicle weight limitations for operation on roads, streets, and bridges may affect the prosecution of work under this contract. The Contractor will be responsible for obtaining all necessary licenses and permits in accordance with the CONTRACT CLAUSE entitled "Permits and Responsibilities".

1.23 OBSTRUCTIONS.

a. Utilities. All utilities located at the site are to remain in place and operative during the construction. The exact location, depth, and height of utilities shown on drawings shall be verified in the field by the Contractor. At least 10 days before beginning work in the vicinity of a utility, the Contractor shall call the appropriate "Call Before You Dig" number listed below. The Contractor shall exercise special care when working in the vicinity of utilities to prevent damage thereto or injury to the Contractor's employees or others. Any damage to the utilities or interruptions of service occasioned by the Contractor's operations shall be repaired and the service restored promptly at his expense.

In the event the Contractor elects to have utilities relocated for his own convenience, he shall make his own arrangement with utility owners for the rerouting and replacement to their permanent location after completion of the work adjacent thereto. All costs associated with utility relocation for the Contractor's convenience shall be at his expense.

CALL BEFORE YOU DIG NUMBERS

Mississippi 1-800 227-6477

b. Existing Fences and Cattle Guards. Existing fences and cattle guards shall not be removed by the Contractor unless written permission is received from the Contracting Officer. Notice of at least 5 days shall be given to the field representative prior to removing any fences or cattle guards any unwarrantable damage to existing fences or cattle guards by th Contractor's operations shall be repaired at his expense.

- 1.24 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES). In compliance with the General Permit of the NPDES, the Contracting Officer will file a Notice of Intent (NOI) with the State of Mississippi. In addition, the Storm Water Pollution Prevention Plan (SWPPP) required by the General Permit has been prepared and is included at the end of these Special Contract Requirements. The Contractor shall adhere strictly to the erosion control provisions of SWPPP and Section 01355A ENVIRONMENTAL PROTECTION to minimize sediment discharge into nearby water courses to the maximum extent practicable. Furthermore, the Contractor and all subcontractors shall sign the certification contained in the SWPPP. The Contractor shall maintain the SWPPP on the construction site at all times. The SWPPP shall take precedence over the technical specifications.
- 1.25 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984). The Contractor shall perform on the site, and with its own organization, work equivalent to at least fifteen (15) percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government. (FAR 52.236-1)

1.26. CONTINUING CONTRACTS (MAR 1995).

- a. This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations, and from future contribution to the project having one or more non-federal project sponsors. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the "Payments Under Fixed-Price Construction Contracts" clause or any other clause of this contract.
- b. The sum of \$5,000 has been reserved for this contract and is available for payments to the Contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds together with funds provided by one or more non-federal project sponsors will be reserved for this contract.
- c. Failure to make payments in excess of the amount currently reserved, or that may be reserved from time to time, shall not entitle the Contractor to a price adjustment

under the terms of this contract except as specifically provided in paragraphs "f" and "i" below. No such failure shall constitute a breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefor.

- d. The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The Contracting Officer will promptly notify the Contractor of any additional funds reserved for the contract by issuing an administrative modification to the contract.
- e. If earnings will be such that funds reserved for the contract will be exhausted before the end of any fiscal year, the Contractor shall give written notice to the Contracting Officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due or to become due under the contract during that fiscal year. This notice shall be given not less than 45 nor more than 60 days prior to the estimated date of exhaustion.
- f. No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The Contractor shall be entitled to simple interest on any payment that the Contracting Officer determines was actually earned under the terms of the contract and would have been made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, as in effect on the first day of the delay in such payment.
- g. Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the Contractor to any price adjustment under the "Suspension of Work" clause or in any other manner under this contract.
- h. An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.
- i. If, upon the expiration of sixty (60) days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the Contractor, by written notice delivered to the Contracting Officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.
- j. If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the Contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the Contractor, to reduce said reservation by the amount of such excess. (EFARS 52.232-5001)

1.27 NOT USED

1.28 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (31 OCT 1989).

- a. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE entitled "**Default** (**Fixed-Price Construction**)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:
- (1) The weather experienced at the project site during the contract period **must be found to be unusually** severe, that is, more severe than the adverse weather anticipated for the project location during any given month.
- (2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.
- b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
10	6	4	4	3	3	2	1	1	2	4	8

c. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as ftill days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph b, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the CONTRACT CLAUSE entitled "Default (Fixed-Price Construction)". (ER 415-1-15, Appendix A)

1.29 NOT USED

1.30. STONE SOURCES.

- a. For a list of quarries that have produced stone that meet the requirements of these specifications, view the website listed below. If a stone source is designated as "New Source," then that source has been tested and the results of those tests have indicated that the stone will meet the material quality requirements. However, the "New Sources" may not have been used; therefore, the stone gradation and quarry production capability may not have been verified. http://155.76.117.11/conops/MVDStoneLST020601.htm
- b. Stone may be furnished either from any of the sources posted at the above website, or from any other sources designated by the Contractor and accepted by the Contracting Officer, subject to the conditions hereinafter stated.
- c. After the award of the contract, the Contractor shall designate in writing only one source or one combination of sources from which he/she proposes to furnish stone. If the Contractor proposes to furnish stone from a source or sources not posted at the above website, he/she may designate only a single source for stone. Samples for acceptance testing shall be provided as required in the Technical Specifications. If the Contracting Officer does not accept a source for stone, so designated by the Contractor, the Contractor may not propose other sources but shall furnish the stone from a posted source at no additional cost to the Government.
- d. In the event that the Contractor proposes to furnish stone from a posted source, and that posted source fails to meet the material quality requirements as set forth in the technical specifications, the Contractor shall identify the reason for the deficiency and shall either rectify the situation or procure stone at another posted quarry. At no time shall stone be accepted that does not fulfill the requirements as described in the technical specifications.
- e. Acceptance of a source of stone shall not be construed as acceptance of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for stone as determined by the Contracting Officer. Materials produced from a posted source shall meet all the requirements of the Technical Specifications.

1.31 FIELD OFFICE BUILDING.

a. The Contractor shall furnish and maintain a temporary building for the exclusive use of the Government inspectors during the life of the contract. The building shall conform to the following requirements:

Type GE Capital Modular Space

Size 12'x64'

Height of Ceiling
Windows
Not less than 7 feet
Not less than 4
Not less than 4
At least 1

Type of Floor Wood or Concrete

The building shall be of light but weatherproof construction. Windows shall be arranged to open and to be fastened from the inside. All door and window openings shall be provided

with suitable screens. The door shall be equipped with a durable hasp and padlock. Interior surfaces of exterior walls and ceilings shall be covered with insulating board and an inside storage room of adequate size shall be provided. The Contractor shall furnish an adequate supply of approved drinking water, sufficient electrical outlets for office calculators and equipment, adequate toilet facilities, all electricity required and sufficient fixtures for adequate lighting, and during cold weather. shall furnish adequate heat. The office shall also be equipped with separate telephone jacks for voice and computer for each office and open area. Each office shall be equipped with at least 2 chairs and one desk. The open area shall have a drafting table and drafting chair. The field office, its location and all facilities shall be subject to the approval of the Contracting Officer. The building shall also be equipped with air conditioning during hot weather.

- b. No separate payment will be made for furnishing and maintaining the field office. Such building will remain the property of the Contractor and shall be removed upon completion of the work as provided in the CONTRACT CLAUSE entitled "Operations and Storage Areas".
- 1.32 SUBMITTALS. Within 15 calendar days after receipt of notice to proceed, the Contractor shall complete and submit to the Contracting Officer, in duplicate, submittal register ENG Form 4288-R listing all submittals and dates. In addition to those items listed on ENG Form 4288-R, the Contractor shall furnish submittals for any deviation from the plans or specifications. The scheduled need dates must be recorded on the document for each item for control purposes. In preparing the document, adequate time (minimum of 30 days) will be allowed for review and approval and possible resubmittal. Scheduling shall be coordinated with the approved progress schedule. The Contractor's Quality Control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective system. Two (2) copies of updated or corrected listing shall be submitted to the Contracting Officer at least every 30 days. Payment will not be made for any material or equipment which does not comply with contract requirements. An original and four (4) copies of all submittals shall be furnished the Contracting Officer. A completed submittal form, ENG Form 4025-R, shall accompany all submittals. Copies of ENG Form 4025-R and ENG Form 4288-R will be furnished the Contractor upon request. Copies of ENG Form 4025-R and ENG Form 4288-R are included at the end of Section 01330 - Submittal Procedures.
- 1.33 <u>HAUL ROADS</u>. Whenever practical, one-way haul roads shall be used on this contract. Haul roads built and maintained for this work shall comply with the following:
- a. One-way haul roads for off-the-road equipment; e.g., belly dumps, scrapers, and off-the-road trucks shall have a minimum usable width of 25 feet. One-way haul roads for over-the-road haulage equipment only (e.g., dump trucks, etc.) may be reduced to a usable width of 15 feet. When the Contracting Officer determines that it is impractical to obtain the required width for one-way haul roads (e.g., a road on top of a levee), a usable width of not less than 10 feet may be approved by the Contracting Officer, provided a positive means of traffic control is implemented. Such positive means shall be signs, signals, and/or signalman, and an effective means of speed control.

- b. Two-way haul roads for off-the-road haulage equipment shall have a usable width of 60 feet. Two-way haul roads for over-the-road haulage equipment only may be reduced to a usable width of 30 feet.
- c. Haul roads shall be graded and otherwise maintained to keep the surface free from potholes, ruts, and similar conditions that could result in unsafe operation.
- d. Grades and curves shall allow a minimum sight distance of 200 feet for one-way roads and 300 feet for two-way roads. Sight distance is defined as the centerline distance an equipment operator (4.5 feet above the road surface) can see an object 4.5 feet above the road surface. When conditions make it impractical to obtain the required sight distance (e.g., ramps over levees), a positive means of traffic control shall be implemented.
- e. Dust abatement shall permit observation of objects on the roadway at a minimum distance of 300 feet.
- f. Haul roads shall have the edges of the usable portion marked with posts at intervals of 50 feet on curves and 200 feet maximum elsewhere. Such markers shall extend 6 feet above the road surface and for nighttime haulage be provided with reflectors in both directions.
- 1.34 <u>TEMPORARY PROJECT FENCING.</u> Temporary project fencing as required by Paragraph 04.A.04 of EM 385-1-1 is not required on this project.
- 1.35 <u>MAINTENANCE OF TRAFFIC.</u> The Contractor shall maintain traffic over **existing roads and bridges in the vicinity of the construction.** The Contractor shall erect and maintain such signs and barricades as the Contracting Officer deems appropriate for protection of the traveling public.
- 1.36 <u>COOPERATION WITH OTHERS.</u> The Contractor shall coordinate all construction operations within the construction and right-of-way limits of this contract with the construction of other contracts, so as to cause the least interruption practicable to operation of other ongoing construction contracts. Close cooperation between the Contractor's personnel and all other personnel will be required. In the event of controversy between the Contractor's personnel and other personnel, the Contracting Officer's decision will be final; however, if the Contractor is in disagreement with the decision, the matter may be pursued under the CONTRACT CLAUSE entitled "Disputes".

1.37 NOT USED

1.38 <u>SUNDAY</u>, <u>HOLIDAY AND NIGHT WORK</u>. Sunday and Holiday work will be at the option of the Contractor, but night work will not be permitted unless otherwise authorized by the Contracting Officer.

1.39 NOT USED

1.40 INSURANCE REQUIREMENTS FOR WORK ON GOVERNMENT PROPERTY.

a. In accordance with the CONTRACT CLAUSE entitled "Insurance - Work on a Government installation", the Contractor shall procure and maintain during the entire performance period of this contract insurance of at least the minimum amounts set forth below:

Type Amount

Workmen's Compensation and \$100,000 or statutory

Employer's Liability Insurance

Comprehensive:

General Liability \$1,000,000 per occurrence

Automobile Liability: \$500,000/\$1,000,000

(1) Bodily Injury \$200,000 per person

\$500,000 per occurrence

(2) Property Damage \$50,000 per occurrence

b. Prior to the commencement of work hereunder, the Contractor shall furnish to the Contracting Officer a certificate or written evidence of the above required insurance. The policies evidencing required insurance shall contain an endorsement to the effect that cancellation or any material change in the policies adversely affecting the interests of the Government in such insurance shall not be effective until 30 days after written notice thereof to the Contracting Officer. Policy shall be issued by a carrier duly qualified to provide above coverages in the State of Mississippi. The policy/policies shall name Desoto County as an additional insured.

Builder's Risk Insurance (Fire and Extended Coverage):

Until the Project is completed and is accepted by the Owner the Contractor is required to maintain Builder's Risk Insurance (fire and extended coverage) adequate to fully cover the insurable portion of the project for the benefit of the Owner, the prime Contractor, and sub-contractors as their interests may appear.

1.41 <u>STORAGE OF EQUIPMENT AND MATERIALS.</u> Storage of the Contractor's equipment and materials shall be at those areas within the rights-of-way designated by the Contracting Officer.

1.42 WARRANTY OF CONSTRUCTION (MAR 1994).

- a. In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph i. of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.
- b. This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before

final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

- c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--
 - (1) The Contractor's failure to conform to contract requirements; or
 - (2) Any defect of equipment, material, workmanship, or design furnished.
- d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.
- e. The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.
- f. If the Contractor falls to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- g. With respect to all warranties, expressed or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--
 - (1) Obtain all warranties that would be given in normal commercial practice;
- (2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and
- (3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.
- h. In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufactureir's, or supplier's warranty.
- i. Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.
- j. This warranty shall not limit the Government's rights under the Inspection and

Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud. (FAR 52.246-21)

1.43 UTILITY SERVICES.

- a. The Contractor shall provide at the site for all work under this contract, the necessary utility services needed for completion of work under this contract.
- b. Electricity: All electric current required by the Contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. All temporary lines shall be furnished, installed, connected and maintained by the Contractor in a workman-like marmer satisfactory to the Contracting Officer, and shall be removed by the Contractor in like manner at his expense prior to completion of the construction.
- 1.44 <u>COMMERCIAL WARRANTY</u>. The Contractor agrees that the building and construction materials and building hardware furnished under this contract shall be covered by the most favorable commercial warranty the Contractor gives to any customer for such products and that the rights and remedies provided herein are in addition to and do not limit any rights afforded to the Government by any other clause of this contract. The warranty will take effect immediately after compliance by the Contractor of these specifications, and acceptance of the completed work by the Government.

1.45. PAYMENT FOR MATERIAL STORED OFFSITE.

- a. In the preparation of monthly progress payment estimates, the Contracting Officer, upon request from the Contractor and in compliance with other criteria as hereinafter stated, will authorize payment, subject to availability of funds, for materials delivered to the Contractor at locations other than the site for the following items:
 - (1) Precast, Prestressed Concrete Deck Units.
 - (2) Piling: Concrete, Precast, Prestressed.
- b. The following criteria must be satisfied before the prescribed payment will be approved.
- (1) The Contractor shall furnish written evidence that he holds title to the material.
 - (2) The Contractor shall furnish evidence of the value of the materials.
- (3) The materials shall have prior approval for incorporation into the work, i.e., required shop drawings, certificates of compliance, etc., must have been submitted and final approval action taken.
- (4) The materials must be properly stored to the satisfaction of the Contracting Officer.

- c. Other materials having a value exceeding \$5,000.00 and delivered to the Contractor at locations other than the site may be considered for payment at the sole discretion of the Contracting Officer.
- 1.46 NOT USED
- 1.47 NOT USED
- 1.48 NOT USED
- 1.49 NOT USED
- 1.50 NOT USED

1.51 PATENTS, PROPRIETARY RIGHTS.

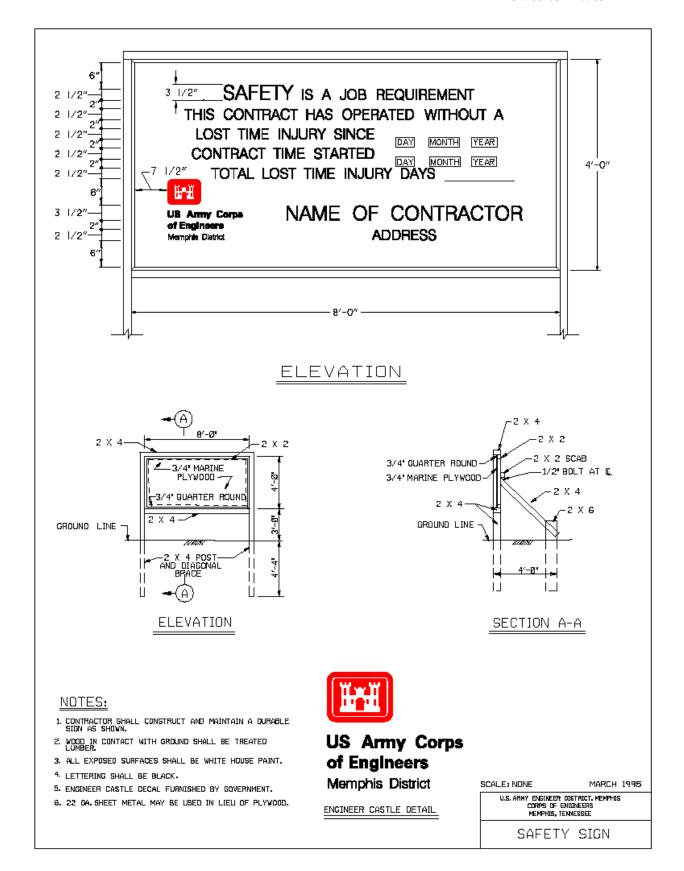
The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

- a. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.
- b. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.
- 1.52 PROTECTION OF MATERIALS AND WORK. The Contractor shall at all times protect and preserve all materials, supplies, and equipment of every description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to enclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies, and work performed are not adequately protected by the Contractor, such property may be protected by the Government and the cost thereof may be charged to the Contractor or deducted from any payments due to him.
- 1.53 NOT USED
- 1.54 NOT USED
- 1.55 NOT USED

1.56 NOT USED

1.57 NOT USED

- 1.58 <u>INSPECTION</u>. All work to be performed under this contract shall conform to the requirements of these specifications and shall be approved by the Contracting Officer. The presence of Government personnel shall not relieve the Contractor of responsibility for the proper execution of the work in accordance with these specifications.
- 1.59 <u>DESIGNATED BILLING OFFICE</u>. The designated billing office for this contract shall be Wynne Area Office, 1932 N. Falls Boulevard, P.O. Box 729, Wynne, Arkansas 72396-0729.
- 1.60 <u>YEAR 2000 COMPLIANCE</u>. In accordance with FAR 39.106, the Contractor shall ensure that with respect to any design, construction, goods, or services Linder this contract as well as any subsequent task/delivery orders issued tinder this contract (if applicable), all information technology contained therein shall be year 2000 compliant. Specifically the Contractor shall:
- a. Perform, maintain, and provide an inventory of all major components to include structures, equipment, items, parts, and **furnishings under this** contract and each task/delivery order which may be affected by the Y2K compliance requirement. Indicate whether each component is currently Year 2000 compliant or requires an upgrade for compliance prior to Government acceptance.



SHORT FORK WASTEWATER TREATMENT FACILITY DESOTO COUNTY, MISSISSIPPI STORM WATER POLLUTION PREVENTION PLAN U.S. ARMY CORPS OF ENGINEERS, MEMPHIS DISTRICT

1. SITE DESCRIPTION

1.1 Nature of Construction

This project consists of preparation and dewatering of site, removal of debris, excavation and backfill, driving of piling, construction of wastewater treatment facility, and seeding and fertilizing of disturbed areas. The facility will be located near Hernando in Desoto County, Mississippi.

1.2 Sequence of Major Activities

The work, which will disturb soils, consists of excavation and backfill for wastewater treatment facility.

1.3 Area Affected

The total area of the site, within the right-of-way limits, which may be impacted by construction, is approximately 101.33 acres.

1.4 Runoff Coefficient and Soils

The runoff coefficient immediately after construction is estimated to range between 0.10 and 0.30. Once the construction has been completed and the disturbed areas have been revegetated, the runoff coefficient should return to pre-construction conditions. Soils in this area consist of silt, silty sands with a mixture of fat and lean clays underlain by sand.

1.5 Site Map

A set of construction drawings showing the project location as well as indicated drainage patterns and approximate slopes before and after completion of construction will be located on the site at all times. Storm water is likely to discharge from the construction area into Short Fork Creek.

1.6 Receiving Water

The receiving stream is a tributary of Coldwater River, located in Desoto County, Mississippi.

2. EROSION AND SEDIMENT CONTROLS

2.1 Non-Structural Measures

2.1.1 General

Prior to the beginning of any construction, the Contracting Officer will identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms outside the construction limits without special permission. The Contractor shall provide effective protection for land, water and vegetation resources at all times. The Contractor shall construct or install temporary and/or permanent erosion and sedimentation control features as indicated herein to minimize pollutants entering streams, water bodies or wetlands.

2.1.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the contract drawings or as directed by the Contracting Officer to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved technique.

2.1.3 Reduction of Exposure of Unprotected Erodible Soils

All earthworks shall be planned and conducted to minimize the duration of exposure of unprotected soils. Vegetative ground cover shall not be destroyed, removed or disturbed more than 20 calendar days prior to grading or earth moving. To the extent feasible, ripraps, side slopes, back slopes, and any other exposed surfaces shall be stabilized by turfing, temporary seeding, mulching, fabric mats or other approved stabilization methods, as soon as possible after work in a particular area is completed or within 7 days on areas that will remain unfinished more than 30 calendar days.

2.1.4 Establishment of Turf

Turf shall be established as a permanent erosion control measure on all areas designated to receive turfing as shown on the plans. Should construction be halted, for any reason, temporarily or permanently, for more than 30 days, in any portion of the site, temporary or permanent turfing measures, or other approved temporary stabilization of exposed areas, such as mulching, shall be initiated as soon as possible, but in no case shall stabilization measures begin more than 7 days after construction is halted. Turf shall be established in accordance with the Contract Technical Specifications.

2.1.5 Seeding

If used, seeding shall be as specified in the Technical Specifications. Temporary seeding shall consist of grasses or grains appropriate for the season in which they are sown. A satisfactory method of sowing shall be employed, using approved mechanical power-driven seeders, mechanical hand-seeders, broadcast-seeders, or other approved methods. When

conditions are such by reasons of drought, high winds, excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted and resumed only when conditions are favorable or when approved alternative or corrective measures and procedures have been effected.

2.1.6 Mulching

If used, mulch shall be material that do not contain noxious grass or weed seed that might be detrimental to the turfing being established. Mulch shall be spread uniformly in a continuous blanket, using 2 tons per acre of straw mulch or 1,200 pounds per acre of wood cellulose fiber mulch

2.1.7 Fertilizer

Fertilizer shall be distributed uniformly over the areas to be turfed at a rate, which will supply not less than 40 pounds of available nitrogen, 40 pounds of available phosphorous, and 40 pounds of potash per acre.

2.2 Structural Measures

2.2.1 General

Temporary erosion and sediment control measures such as silt fences, check dams, and sedimentation basins shall be constructed as necessary and maintained until the project is complete and final stabilization is in effect, after which they shall be removed. Erosion and sediment control measures must be in place and functional before earth moving operations begin, and must be constructed and maintained throughout the construction period. If necessary for construction, temporary measures may be removed at the beginning of the workday, but must be replaced at the end of the workday; however, at no time will silt-laden stormwater be allowed to discharge into adjacent streams, waterbodies or wetlands. All control measures shall be checked, and repaired as necessary, weekly in dry periods and within 24 hours after any rainfall of 0.5 inches within a 24-hour period. During prolonged rainfall, daily checking and repairing is necessary.

2.2.2 Silt Fences

If used, silt fences shall be constructed along the toe ends of each embankment and any other areas necessary to minimize the entry of erosive material into watercourses or wetlands. Fences shall be constructed of baled straw or other equivalent devices in accordance with Drawing C-14.

2.2.3 Check Dams

Check dams shall be constructed across ditches, drains and swales using baled straw or equivalent devices to minimize sediment transport away from the site and into watercourses or wetlands. Check dams shall be inspected for sediment accumulation after each significant

rainfall and sediment removed when it reaches one-half the height of the barrier. Sediment removal shall include removal and disposition in a location where it will not erode into construction areas, watercourses or wetlands. Dams shall be constructed in accordance with Drawing C-14.

2.2.4 Sediment Basins

Sediment from construction areas with 10 or more disturbed acres at one time, may be trapped in temporary or permanent basins. After each storm, the basins shall be allowed to settle for 24 to 48 hours after which the accumulated water may be removed. In order to maintain basin effectiveness, accumulated sediment shall be removed when the depth of sediment reaches one-third of the depth of structure in any part of the pool. Discharge shall be controlled by paved weir, by vertical overflow pipe draining from the surface, or by a spillway protected by baled straw filter barriers in the spillway and at the outlet toe of the spillway. If pumps are used, the discharge shall be such that there is no deposition or sediment in streams or wetlands. The collected sediment shall be reused for fill on the construction site, or placed in a suitable disposal area and stabilized. If used, the basins shall provide at least 3,600 cubic feet of storage for each acre drained. Where such basins are not used, other equivalent sediment control measures are required. Basins shall be constructed in accordance with Drawing C-14. Existing or newly excavated material borrow areas may be utilized as temporary or permanent sedimentation basins with discharge controlled as above.

2.2.5 Other Measures

Other temporary erosion and sediment control devices such as dikes, swales, and drains may be used as necessary or in lieu of the above mentioned measures provided they are consistent with Best Management Practices (BMPs) and approved by the Contracting Officer. These devices shall be maintained until permanent drainage and erosion control facilities are complete and operative. Earthen erosion control features shall be compacted and stabilized immediately with vegetation as specified in paragraphs 2.1.5 and 2.1.6.

2.2.6 Velocity Dissipation Devices

Should drains or swales be used, they shall be constructed with velocity dissipation devices (check drains). These devices shall be removed after the erosive areas have been stabilized. Check dams shall be utilized in any other areas where required.

2.3 Records

A record of the dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated and completed shall be kept by the Contracting Officer at the construction site at all times.

3. STORM WATER MANAGEMENT

In order to provide permanent storm water pollution protection, turf shall be established on all disturbed areas within the construction limits. Permanent turf shall be established in accordance with the Contract Technical Specifications. A specific individual shall be designated to be responsible for erosion and sediment controls.

4. OTHER CONTROLS

4.1 General

Construction activities shall be kept under surveillance, management and control to avoid pollution of surface and ground waters. Special management techniques shall be implemented to control water pollution.

4.2 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers, which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination. All solid wastes shall be transported off the work site and disposed of in compliance with Federal, State and local regulations.

4.3 Chemical Wastes

Chemical wastes shall be stored in corrosion resistant containers, removed from the work area, and disposed of in accordance with Federal, State and local regulations.

4.4 Off-Site Vehicle Tracking

Off-site vehicle tracking of sediments and the generation of dust shall be minimized.

4.5 Washing and Curing Water

Wastewaters directly derived from construction activities shall not be allowed to enter waterways. These wastewaters shall be collected and placed in retention ponds where suspended material can settle out or the water evaporates so that pollutants are separated from the water.

5. STATE AND LOCAL PLANS

There are no known State or local erosion and sediment control requirements applicable to this work other than those met by the requirements of this permit.

6. MAINTENANCE

All maintenance of the Wastewater Treatment Facility is the responsibility of Desoto County, Mississippi.

7. INSPECTIONS

7.1 General

Quality assurance representatives shall inspect disturbed areas of the construction site and areas used for storage of materials that are exposed to precipitation and have not been finally stabilized, structural control measures and locations where vehicles enter or exit the site every seven (7) calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater. Where sites have been stabilized, inspections shall be conducted at least once every month.

7.2 <u>Disturbed Areas and Areas Used for Material Storage</u>

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operated correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

7.3 Modification of Pollution Plan

Based on the results of the inspection in paragraph 7.2, the site description identified in paragraph 1 and 2 of this plan shall be revised as appropriate, but in no case more than 7 calendar days following the inspection. Such modifications shall provide for timely implementation of any changes to the plan within 7 calendar days following the inspection.

7.4 Reports

A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan (SWPPP), and actions taken shall be recorded and retained as part of the SWPPP for at least three (3) years from the date the site is finally stabilized.

8. DEFINITIONS

8.1 Best Management Practices (BMPs)

Schedules of activities, prohibitions of practices, maintenance procedures, and other management practice to prevent or reduce the pollution of waters of the State. BMPs also

include treatment requirements, operation procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

8.2 Commencement of Construction

The initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

8.3 Drainage Swale

A drainage way with a lining of grass, riprap, asphalt, or other material installed to convey runoff without causing erosion.

8.4 Check Dam

Small temporary dams constructed across a swale or drainage ditch to reduce the velocity of runoff flows.

8.5 Final Stabilization

All soil-disturbing activities at the site have been completed, and a uniform perennial vegetative cover with a density of 85% of the cover for the area has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed.

9. CERTIFICATION

"I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification."

Jack V. Scherer, Colonel, Corps of Engineers, Memphis District Engineer Name and Official Title	01-544-3221 Phone No.
Signature	Date Signed
Name and Official Title of Contractor	Phone No.
Signature	Date Signed
Name and Official Title of Subcontractor	Phone No.
Signature	Date Signed
Name and Official Title of Subcontractor	Phone No.
Signature	Date Signed

SHORT FORK WASTEWATER TREATMENT FACILITY **DESOTO COUNTY, MISSISSIPPI**

CECTION NO	TECHNICAL SPECIFICATIONS
SECTION NO.	<u>DESCRIPTION</u>
	DIVISION 1 – GENERAL REQUIREMENTS
01270A	MEASUREMENT AND PAYMENT
01330	SUBMITTAL PROCEDURES
01355A	ENVIRONMENTAL PROTECTION
01356 01451A	STORM WATER POLLUTION PREVENTION MEASURES CONTRACTOR QUALITY CONTROL
01451A	PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL SIGNS
01781	OPERATION AND MAINTENANCE DATA
GI-1	GENERAL INSTRUCTIONS FOR TECHNICAL SPECIFICATIONS
GCN-1	GENERAL CONSTRUCTION NOTES
	DIVISION 2 – SITEWORK
02020	EROSION CONTROL
02111	CLEARING AND GRUBBING
02200	EARTHWORK
02220 02232	DEWATERING GRANULAR BASE COURSE
02232	FILTER CLOTH AND EROSION CONTROL FABRIC
02272	RIPRAP
02273	PAVED DITCHES
02367	PRESTRESSED CONCRETE PILES
02480 02485	SEEDING AND FERTILIZING BERMUDA SOD
02490	TREES, PLANTS AND GROUND COVER
02500	STORM DRAINAGE
02557	CONCRETE DRIVEWAYS
02558	CONCRETE SIDEWALK
02560 02561	SANITARY SEWERAGE – PROCESS PIPING INTERIOR COATINGS FOR CONCRETE AND DUCTILE IRON SANITARY SEWER PIPE
02562	MONOLITHIC MANHOLE SURFACING SYSTEM
02602	SLIP-ON FLAT BOTTOM CHECK VALVES
02660	WATER DISTRIBUTION SYSTEM
02700	LIME TREATED BASE COURSE
02810 02830	IRRIGATION SYSTEM CHAIN LINK FENCING AND GATES
02030	
	DIVISION 3 – CONCRETE
03100	CONCRETE FORMWORK
03200 03300	CONCRETE REINFORCEMENT CAST IN PLACE CONCRETE
03300	
	DIVISION 4 – MASONRY
04810	UNIT MASONRY ASSEMBLIES
	DIVISION 5 – METALS
05310	STEEL DECK
05400	COLD FORMED METAL FRAMING
05401	LIGHT GAUGE PRE-ENGINEERED STEEL TRUSSES
05500	METAL FABRICATIONS
05521 05530	PIPE AND TUBE RAILINGS GRATING AND FLOOR PLATES
	DIVISION 6 - WOOD AND PLASTICS
06100	ROUGH CARPENTRY
06114	WOOD BLOCKING AND CURBING
06200	FINISH CARPENTRY
06610	GLASS FIBER AND RESIN FABRICATIONS
06620	CAST PLASTIC FABRICATIONS

TECHNICAL TOC-1

CAST PLASTIC FABRICATIONS

06620

SECTION NO.	<u>DESCRIPTION</u> DIVISION 7 – THERMAL AND MOISTURE PROTECTION
07212 07610 07631 07900	BOARD AND BATT INSULATION SHEET METAL ROOFING GUTTERS AND DOWNSPOUTS JOINT SEALERS
	DIVISION 8 – DOORS AND WINDOWS
08110 08211 08360 08410 08520 08710 08800	STEEL DOORS AND FRAMES FLUSH WOOD DOORS OVERHEAD DOORS METAL FRAMED STOREFRONTS ALUMINUM WINDOWS DOOR HARDWARE GLAZING
	DIVISION 9 – FINISHES
09260 09511 09650 09680 09900	GYPSUM BOARD ASSEMBLIES SUSPENDED ACOUSTICAL CEILINGS RESILIENT FLOORING CARPET PAINTS AND COATINGS
	DIVISION 10 – SPECIALTIES
10100 10171 10446 10500 10523 10800	VISUAL DISPLAY BOARDS SOLID PLASTIC TOILET COMPARTMENTS PLASTIC SIGNS LOCKERS FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES TOILET, BATH AND LAUNDRY ACCESSORIES
	DIVISION 11 – EQUIPMENT
11450 11600	RESIDENTIAL EQUIPMENT WASTEWATER LABORATORY EQUIPMENT
	DVIISION 12 – FURNISHINGS
12311	METAL CASEWORK
	DIVISION 13 – SPECIAL CONSTRUCTION
13121 13310 13350	PRE-ENGINEERED BUILDINGS ELECTICAL, INSTRUMENTATION AND CONTROLS EXTERIOR ELECTRICAL BUILDING
	DIVISION 14 – CONVEYING SYSTEMS NONE USED
	DIVISION 15 – MECHANICAL
15100 15117 15118 15119 15120 15173 15174 15244 15262 15350 15351 15352 15353 15381 15382 15383	PIPE SUPPORTS AND HANGERS FABRICATED STAINLESS STEEL SLIDE GATES TELESCOPING (SLIP SEAL) VALVES WASTE SLUDGE CONTROL VALVE FABRICATED ALUMINUM SLIDE GATES PARSHALL FLUME ULTRASONIC FLOW METER PRESTRESSED COMPOSTIE TANKS ULTRAVIOLET DISINFECTION EQUIPMENT INFLUENT PUMPING STATION EFFLUENT PUMPS SCUM PUMPING STATION SUBMERSIBLE CHOPPER PUMPS FOR DECANT PUMP STATION MECHANICAL BAR SCREEN HYDRAULIC REMOVAL CLARIFIERS CLARIFER ALGAE SWEEP

TECHNICAL TOC-2

SECTION NO.	DESCRIPTION
15384	SCREW PUMP EQUIPMENT
15386	GRIT REMOVAL SYSTEM
15390	AERATION BASIN SPECIFICATIONS
15391	LOW PROFILE PACKAGED CASCADE AERATOR
15392	HYDRAULIC GRINDER WITH ROTATING SCREENS
15393	SLUDGE BELT FILTER PRESS
15394	CENTRIFUGAL BLOWER
15395	POLYMER SYSTEM
15396	AEROBIC DIGESTER
15397	SHAFTLESS-SCREW SLUDGE CONVEYOR
15398	VERTICAL PROGRESSING CAVITY PUMPS
15400	PLUMBING
15800	HEATING, VENTILATING AND AIR CONDITIONING
	DIVISION 16 - ELECTRICAL
16010	ELECTRICAL GENERAL REQUIREMENTS
16030	ELECTRICAL SYSTEMS SCHEDULE
16050	BASIC MATERIALS AND METHODS
16060	GROUNDING
16070	HANGERS AND SUPPORTS
16075	ELECTRICAL IDENTIFICATION
16123	BUILDING WIRE AND CABLE
16131	CONDUIT
16138	BOXES
16139	CABINETS AND ENCLOSURES
16140	WIRING DEVICES
16155	EQUIPMENT WIRING
16210	ELECTRICAL UTILITY SERVICES
16231	PACKAGED ENGINE GENERATORS
16272	DRY TYPE TRANSFORMERS
16411	ENCLOSED CIRCUIT BREAKERS
16412	ENCLOSED SWITCHES
16413	AUTOMATIC TRANSFER SWITCH
16423	ENCLOSED MOTOR CONTROLLERS
16426	ENCLOSED CONTACTORS
16443	PANELBOARDS POWER CONTROL CENTER
16480	POWER CONTROL CENTER
16481	MOTOR CONTROL CENTER
16482	VARIABLE FREQUENCY DRIVES FUSES
16491	LIGHTING FIXTURES
16510	
16821	MISCELLANEOUS RACEWAY SYSTEMS

GEOTECHNICAL REPORT BY AQUATERRA ENGINEERS, LLC

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01270A

MEASUREMENT AND PAYMENT

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SECTION 01270A

MEASUREMENT AND PAYMENT

PART I - GENERAL

1-1 LUMP SUM BID ITEMS

1-1-1 General

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BID FORM and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1-1-2 Lump Sum Items

(1) "SHORT FORK WASTEWATER TREATMENT FACILITY" (EXCLUDING OPTION 1, OPTION 2, PILING and LIME)

a. Payment

Payment will be made for all costs associated with providing all items installed and in complete working order as shown on or contained within the plans and specifications entitled Phase I-A Short Fork Wastewater Treatment Facility dated December, 2002, excluding piling (14" and 16"), lime, lime-soil-water mixing, allowances for furnishings and vegetative screenings and items specifically listed under Option #1 and Option #2.

b. Measurement

Measurement for this item shall be Lump Sum: L.S.

1-2 UNIT PRICE BID ITEMS

1-2-1 General

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BID FORM and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work

required for each of the unit price items.

1-2-2 Unit Price Items

(2) PRESTRESSED CONCRETE PILING (14")

(3) PRESTRESSED CONCRETE PILING (16")

a. Payment

See Section 02367 "PRESTRESSED CONCRETE PILING" for payment.

b. Measurement

See Section 02367 "PRESTRESSED CONCRETE PILING" for measurement.

(4) LIME

a. Payment

See Section 02700 "LIME TREATED BASE COURSE" for payment.

b. Measurement

See Section 02700 "LIME TREATED BASE COURSE" for measurement.

(5) LIME-SOIL-WATER MIXING

a. Payment

See Section 02700 "LIME TREATED BASE COURSE" for payment.

b. Measurement

See Section 02700 "LIME TREATED BASE COURSE" for measurement.

1-3 ALLOWANCE BID ITEMS

1-3-1 General

Payment items for the work of this contract for which allowance payments (AL) will be made are listed in the BID FORM and described below. It is understood that the CONTRACTOR has included in the Total Contract Price all allowances as described below and shall cause the Work so covered to be performed for such sums as may be acceptable to the CONTRACTING OFFICER. The CONTRACTOR agrees that:

Payment for allowances shall include the cost to CONTRACTOR of materials and equipment required by the allowances to be delivered to the Site, and all applicable taxes. The

CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Bid Item #1, LS and is not to be a part of the allowance and no demands for additional payment on account of any of the foregoing will be valid.

Prior to final payment, an appropriate Change Order will be issued as recommended by the CONTRACTING OFFICER to reflect actual amounts due the CONTRACTOR for Work covered by allowances if the specified amounts are more or less than those amounts specified herein. All invoices shall be provided with the CONTRACTOR'S pay request for each specific item requesting payment.

1-3-2 Allowance Items

(6) ALLOWANCE FOR FURNISHINGS

a. Payment

Payment shall be made for the items listed in the measurement section below as stipulated under Subsection 1-3-1 "General" of Section 1-3 "Allowance Bid Items". The CONTRACTOR shall record and furnish to the CONTRACTING OFFICER all invoices showing all applicable costs for delivered item to the site in order to receive payment for individual items.

Furnishings Allowance

\$12,000.00

b. Measurement

The measurement of the allowance for furnishings shall consist of the selection by the CONTRACTING OFFICER of the following items:

- 1. Office Furniture
- 2. Chairs
- 3. Bookcases
- 4. File Cabinets
- 5. Conference Table
- 6. Miscellaneous Furniture Items

(7) ALLOWANCE FOR VEGETATIVE SCREENING

a. Payment

Payment shall be made for the items listed in the measurement section below. Payment shall be for Landscape Plantings installed and complete in living condition. The CONTRACTOR shall record and furnish to the CONTRACTING OFFICER all invoices showing all applicable costs for installed items in order to received payment for individual items. All

Landscaping shown on the drawings shall be included in the Lump Sum Bid Item #1 and will not be considered for payment under this allowance.

Vegetative Screening Allowance \$20,000.00

b. Measurement

Measurement shall include the following Vegetative Screening:

1. Buffer planting materials along the boundary of Short Fork Creek. Materials to be selected by the CONTRACTING OFFICER. Limits of plantings to be determined during construction by the CONTRACTING OFFICER.

1-4 **OPTION** #1

1-4-1 General

Payment items for the work of this contract that is listed under Option #1 and Option #2 shall include the items listed below. The items listed as lump sum payments under these options shall be subject to those requirements listed in Section 1.1.1 of this specification. Those items listed as unit price bid items under these options shall be subject to those requirements listed in Section 1.2.1 of this specification.

1-4-2 Option #1 Items

<u>ADD</u> INFLUENT JUNCTION BOX, INFLUENT PUMP STATION, CAMP CREEK 54" INTERCEPTOR SEWER, SHORT FORK CREEK 36" INTERCEPTOR SEWER, AND NECESSARY PIPING AND APPURTENANCES AND REPLACE SCUM PUMP STATION AND APPURTENANCES

(1&2) INFLUENT JUNCTION BOX AND PUMP STATION

a. Payment

Payment will be made for all costs associated with providing the following items:

- 1. Influent Junction Box
- 2. Influent Pump Station
- 3. All other excavation, backfill, sheeting, shoring, electrical, piping and mechanical requirements to construct and complete the systems described on sheets P.04, M1.01, M1.02, M1.03, S1.01, S1.02, S1.03, and S1.04.
- 4. Replace the scum pump station and and appurtenances and all 4" ductile iron force main called for to be furnished and installed as indicated on sheet P.04 of the drawings with the necessary 6" and 10"

ductile iron gravity sewer and manholes as indicated on sheet P.04A including all excavation, sheeting, shoring, backfilling, and all other work and appurtenances required to complete the installation of the scum piping.

b. Measurement

Measurement for this item shall be Lump Sum: L.S.

(3) SHORT FORK CREEK 36" INTERCEPTOR SEWER

a. Payment

Payment will be made for all costs associated with providing the following items:

- 1. All 36" ductile iron gravity sewer and manholes called for to be furnished and installed as indicated as the Short Fork Creek Interceptor on Sheet P.09 of the Drawings.
- 2. All excavation, sheeting shoring, backfilling, and all other work and appurtenances required to complete the installation on the Short Fork Creek Interceptor Sewer Influent Line as indicated on Sheet P.09 of the Drawings.

b. Measurement

Measurement for this item shall be Lump Sum: L.S.

(4) CAMP CREEK 54" INTERCEPTOR SEWER

a. Payment

Payment will be made for all costs associated with providing the following items:

- 1. All 54" ductile iron gravity sewer and manholes called for to be furnished and installed as indicated on sheet P.08 of the drawings.
- 2. All excavation, sheeting, shoring, backfilling, and all other work and appurtenances required to complete the installation on the Camp Creek Interceptor Sewer Influent Line as indicated on sheet P.08 of the drawings.

b. Measurement

Measurement for this item shall be Lump Sum: L.S.

(5) 64" INFLUENT SEWER LINE

a. Payment

Payment will be made for all costs associated with providing the following items:

- 1. All 64" ductile iron gravity sewer called for to be furnished and installed as indicated on sheet P.04A of the drawings.
- 2. All excavation, sheeting, shoring, backfilling, and all other work and appurtenances required to complete the installation on the 64" Influent Line from the Influent Junction Box to the Influent Pump Station as indicated on sheet P.04A of the drawings.

b. Measurement

Measurement for this item shall be Lump Sum: L.S.

1-5 **OPTION #2**

1-5-1 General

Payment items for the work of this contract that is listed under Option #2 shall include the items listed below. The items listed as lump sum payments under this option shall be subject to those requirements listed in Section 1.1.1 of this specification. Those items listed as unit price bid items under this option shall be subject to those requirements listed in Section 1.2.1 of this specification.

1-5-2 Option #2 Items

(1) <u>ADD</u> DIGESTER, THICKENER, BELT PRESS AND SOLIDS HANDLINGS BUILDING AND <u>DEDUCT</u> LAGOON & LAGOON APPURTENANCES (EXCLUDING PILING)

a. Payment

Payment will be made for all costs associated with providing the following items:

- 1. Sludge Digester/Thickener
- 2. Centrifugal Blowers
- 3. Solids Handling Building
- 4. Sludge Belt Press
- 4. Polymer Feed System
- 5. All other excavation, backfill, sheeting, shoring, electrical, piping, and mechanical requirements to construct, complete, the systems described on Sheets C.04A, C.05A, P.05A, M11.01-M11.04, M12.01-M12.02, S11.01-S11.02, A3.02, A6.02, AS2.01-AS2.02, AS3.04-AS3.05, AP2.01-AP2.02, AM2.01-AM2.02, and E.08.

- 6. The following items shall be deducted as a part of the Lagoon and Lagoon appurtenances:
 - Grading, drainage, erosion control measures, and water system for Sludge Lagoons as indicated on Sheets C.04, C.05, C.06, and C.07 to be eliminated or reduced as a part of Option #2.
 - Sludge Lagoons #1 and #2
 - Sludge Lagoon Effluent Structures #1 and #2
 - All other excavation, backfill, sheeting, shoring, electrical, piping, and mechanical requirements to construct, complete, the systems described on Sheet C.15 and P.05.

b. Measurement

Measurement for this item shall be Lump Sum: L.S.

(2) PRESTRESSED CONCRETE PILING (16")

a. Payment

See Section 02367 "PRESTRESSED CONCRETE PILING" for payment.

b. Measurement

See Section 02367 "PRESTRESSED CONCRETE PILING" for measurement.

(3) PRESTRESSED CONCRETE PILING (20")

a. Payment

See Section 02367 "PRESTRESSED CONCRETE PILING" for payment.

b. Measurement

See Section 02367 "PRESTRESSED CONCRETE PILING" for measurement.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

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PART 1 – GENERAL

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1-01 SUBMITTAL IDENTIFICATION

SD-01 Data

SD-04 Drawings

SD-06 Instructions

SD-07 Schedules

SD-08 Statements

SD-09 Reports

SD-13 Certificates

SD-14 Samples

SD-18 Records

SD-19 Operation and Maintenance Manuals

1-02 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1-02.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1-02.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1-03 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check,

but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for an error that may exist, as the Contractor is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, resubmitting for the purpose of substituting materials or equipment will not be considered unless accompanied by an explanation of why a substitution is necessary.

1-04 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1-05 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3-01 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3-02 SUBMITTAL REGISTER (ENG FORM 4288R)

At the end of this section is one set of ENG Form 4288R listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contracting officer will give the

Contractor the submittal register as a diskette containing the computerized ENG Form 4288R and instructions on the use of the diskette. Columns "d" through "q" have been completed by the Government; the Contractor shall complete columns "a" and "r" through "t" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 15 calendar days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

3-03 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (15 calender days for FIO submittals; 30 calender days for GA submittals and re-submittals; 45 calender days for submittals requesting variation or deviation from contract requirements) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

3-04 TRANSMITTAL FORM (ENG FORM 4025R)

The sample transmittal form (ENG Form 4025R) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3-05 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3-05.1 Procedures

Submittals shall be prepared as specified with the required number of copies and delivered to: U.S. Army Corps of Engineers
Wynne Area Office
1932 N. Falls Boulevard
Wynne, Arkansas 72396

3-05.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025R shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3-06 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3-07 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Four copies of the submittal will be retained by the Contracting Officer and two (2) copies of the submittal will be returned to the Contractor.

3-08 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3-09 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to that shown:

CONTRACTOR
(Firm Name)
Approved
Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE: TITLE: DATE:

DACW66-03-B-0003

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- 1. Section 1 will be initiated by the Contractor in the required number of copies.
- 2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals, mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
- 3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288 for each entry on this form.
- 4. Submittals requiring expeditious handling will be submitted on a separate form.
- 5. Separate transmittal form will be used for submittals under separate sections of the specifications.
- 6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".
- Form is self-transmittal, letter of transmittal is not required.
- 8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
- 9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted. E -- Disapproved (See attached).

B -- Approved, except as noted on drawings. F -- Receipt acknowledge.

C -- Approved, except as noted on drawings. FX -- Receipt acknowledged, does not comply Refer to attached sheet resubmission required. as noted with contract requirements.

D -- Will be returned by separate correspondence. G -- Other (Specify)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

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INSTRUCTIONS

- 1. Section I will be initiated by the Contractor in the required number of copies.
- 2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
- 3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.
- 4. Submittals requiring expeditious handling will be submitted on a separate form.
- 5. Separate transmittal form will be used for submittals under separate sections of the specifications.
- 6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".
- 7. Form is self-transmittal, letter of transmittal is not required.
- 8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
- 9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column q, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

Α	 Approved as submitted.	Е	 Disapproved (See attached).
В	 Approved, except as noted on drawings.	F	 Receipt acknowledged.
С	 Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX	 Receipt acknowledged, does not comply as noted with contract requirements.
D	 Will be returned by separate correspondence.	G	 Other (Specify)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contact plans and specifications.

(Reverse of ENG Form 4025-R)

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(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
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(ER 415 1-10)

EGISTER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 01356 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: STORM WATER POLLUTION PREVENTION MEASURES TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С Ν М Т S F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S S NY T D R Ε Ε X 1-03 Compliance Certificate

TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCAT	ION	Short For	k Wastewater Treatment													CONT	RACTOR				SPECIFICATION SECTION:					
			Facility, [Desoto County, Mississippi																				01451A			
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 02020 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: EROSION CONTROL TYPE OF SUBMITTAL FICATION ACTION E R N S O & Α G С М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N T 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 G S E S E S Т Ν Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S T D R Ε Ε 1.03 **Erosion Control Plan** X

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 02200 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: EARTHWORK TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С М 0 Т S C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N T 0 A T Р U ΤО МО М Ε С R T A L S Ν L I N ΕV W 0 Α 0 L 0 E S G S E S Ν Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S T D R Ε Е 3-01 Dewatering Plan X X 3-03 Density Test Χ Χ

CONTRACTOR

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 02232 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: GRANULAR SUBBASE COURSE TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С S Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α Α M V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 G S E S E S Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S T D R Ε Ε 3-03 Test Results Χ

CONTRACTOR

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 02271 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: GEOTEXTILE FABRIC TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С М Т S C 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ΤО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 Е E S G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Е X 1-02 Filter Cloth X Erosion Control Fabric 1-02 Х Χ

CONTRACTOR

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 02272 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: RIPRAP TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-**SPECIFICATION** APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR ORDS U E N 0 A T Р U ΤО МО M Ε С R T A L S Ν L I N ΕV W 0 Α 0 L 0 G S E S E S Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S T D R Ε Ε aa. 2-02 **Test Results** X X

CONTRACTOR

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 02273 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: PAVED DITCHES TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С М Т S C 0 R V A TRANS-**SPECIFICATION** APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV 0 Α 0 L W 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S T D R Ε Ε 3-02 **Test Results** X X

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATION Short Fork Wastewater Treatment Facility, Desoto County, Mississippi														CONT	RACTOR			SPECIFICATION SECTION:								
			Facility, D	Desoto County, Mississippi																				02367			
SECTIO	N TITLE:	PRE	STRESSED CONC	RETE PILES				TYPE	OF S	SUBM	ITTAL				CLA FICA	ASSI- ATION		,	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMENT ACTION			
A C T I V I T Y	TRANS- MITTAL NO	I T E M N O	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G %	- N S T R U C T - O N S	0 С Н Н О С L Н 0	STATEMENTS	R E P O R T S	CERTIFICATES	8 A M P L E 8	RECORDS	O & M M A Z D A L S	I N F O R M A T O L N Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS	
a.	b.	C.	d. 1-04	Experience	f.	g.	h.	I.	j.	k.	<u>.</u>	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.	
				Concrete Piles		Х										Х											
				Contractor-furnished		^										^											
				Mix Design	Х											Х											
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(ER 415 1-10)

CONTRACT NO.

TITLE AN	AND LOCATION Short Fork Wastewater Treatment Facility, Desoto County, Mississippi																CONT	RACTOR				SPECIFICATION SECTION:					
			Facility, [Desoto County, Mississippi																				02480			
SECTION	N TITLE:	SEE	DING AND FERTIL	IZING			1	TYPE	OF S	UBMI	ITTAL					ASSI- ATION	CONTRACTOR CONTRACTO SCHEDULE DATES ACTION							GOVERNMEN			
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	DRAWINGS a	N S T R U C T O N S h	% C H E D D L E % -	S T A T E M E N T S :	REPORTSk	CERTIFICATESI	S A M P L E S E.	RECORDS n.	O & M M A Z D A L % o	I N F O R M A T N U Y P.	G O V A E P R P N R O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E	DATE z.	REMARKS aa.	
	- J.		2-02	Grass Seed	X	ਤ-			٠.					J.	X	٦.		J.		<u> </u>	Ť	"	Λ.	J.	<u>-</u> .	au.	
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION CONTRACTOR SPECIFICATION SECTION: Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 02490 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: TREES, PLANTS AND GROUND COVER TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν М Т S F 0 C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E ΕP R F S М Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε Χ X 1-04 Mulch X Guy Wire Χ 1-04 1-04 X Stakes Fertilizer 1-04 Χ Χ 1-04 X Maintenance

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 02500 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: STORM DRAINAGE TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N T 0 A T Р U ΤО МО М O R D S Ε С С R T A L S Α Ν L I N ΕV W 0 0 L 0 E S G S Е E S Т Ν O L ΝE Ε D D Ν Ν S NY 0 0 S S S T D R Ε Е 1.03 Certified Test Reports X 1-03 Concrete Pipe Χ

CONTRACTOR

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

	Facility, Desoto County, Mississippi ON TITLE: CONCRETE DRIVEWAYS TYPE OF SUBMITTAL CLASSI- FIGATION																					025				
SECTIO	N TITLE:	CON	ICRETE DRIVEWA	YS				TYPE	OF S	SUBN	IITTA	L			CLA FICA	ASSI- ATION			CONTRACT	OR ATES		CONTRA	CTOR ON	GOVERNMENT ACTION		
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T	D R A & - Z G	I N S T R U C T I O N	8 C H H D D L H	S T A T E M E N T	R E P O R T	I C A T E	A M P L	R E C O R D	O & M M A N U A L	I N F O R M A T O N O L	G O V A E P R P N R M O E V N E	R E V I E W E	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	СОО	DATE	SUBMIT TO GOVERN- MENT	C O D	DATE	REMARKS
O a.	b.	O c.	d.	e.	A f.	S g.	S h.	S I.	S i.	S k.	S I.	S m.	S n.	S o.	N Y p.	T D q.	R r.	S.	t.	u.	E v.	w.	x.	E v.	Z.	aa.
			2-02	Test Results	Х	J									X											
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CONTRACTOR

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

TITLE AN	ND LOCATI	ON	Short For	k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				025	58	
SECTION	N TITLE:	CON	ICRETE SIDEWALK	<				TYPE	OF S	UBMI	ITTAL				CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA	CTOR ON	GOVERNMEN		
A C T I V I T Y N O O O	TRANS- MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A	D R A W - N G S d	- N S T R U C T - O Z S h	8 C H E D D L E 8 -	STATEMENTS:	REPORTS	C E R T I F I C A T E S I	SAMPLESE.	RECORDS r.	O & M M A Z D A L % o	I N F O R M A T O I N O L N Y	G O V A E P R P N R O E V N E T D	REVIEWER	SUBMIT	APPROVAL	MATERIAL NEEDED BY	C O D E v.	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.		2-02	Test Results	X	g.	11.	1.	J-	ĸ.	1.	III.	11.	U.	р. Х	q.	1.	S.	l.	u.	V.	W.	X.	у.	Z.	aa.
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(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				025	60_	
SECTIO	N TITLE:	SAN	IITARY SEWAGE - I	PROCESS PIPING				TYPE	OF S	SUBM	IITTA	L				ASSI- ATION		,	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M N O	SPECIFICATION PARAGRAPH NUMBER	SUBMITTED	D A T A f.	DRAW-NGS	- N S T R U C T - O N S .	осн по ог по.	S T A T E M E N T S .	R E P O R T S .	C E R T I F I C A T E S .	S A M P L E S	R E C O R D S	O & M M A N U A L S	I N F O R M A T O L N Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	1-05	e. Shop Drawings	f.	g. X	h.	I.	j.	k.	I.	m.	n.	0.	p.	q. X	r.	S.	t.	u.	٧.	W.	X.	y.	Z.	aa.
	-	\vdash			 	^					_	-	-	\vdash		 ^		}	 		<u> </u>		1	 		
			1-05	Test Report						X					X											
			1-05	Manufacturer's																						
				Certification							X				Х											
			1-05	Manufacturer's catalog	X										X											
			1-05	Specification Sheets			X								X											
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

CONTRACTOR

NTERIOR CONTINGE FOR CONCRETE AND D.L. SANTARY SEVER PIPE TYPE OF SUBMITTAL FRANCH FRANCH					Desoto County, Mississippi																				0256	31	
A C C E R R N F O O V A R S S S T T T T N M F O O V A R S S S T N T T N M R P V N M R P V N M R P V N M R P V N M R T D M P C M C N A N N R T D M P C M C N A N N R T D M P C M C N A N N R T D M P C M C N A S S S S S S S S S S S S S S S S S S	INTERIO	R COATIN	GS FC	OR CONCRETE AN	D D.I. SANITARY SEWER PIPE			-	TYPE	OF S	UBM	ITTAL	-			CLA FICA	ASSI- ATION			CONTRACT	OR ATES		CONTRA	ACTOR ON			
2-02 Lining Material X X X X	C T I V I T Y	MITTAL NO	E M N O	PARAGRAPH NUMBER	DESCRIPTION OF ITEM	A T A	RAW-RGS	N S F R U C F - O Z S	Сншоогш	T A T E M E N T	E P O R T S	T I F I C A T E S	A M P	ECORDS	MARUALO	I N F O R M A T O N L N	G O V A E P R P N R O E V N E V N E T D	E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	O D E	DATE	SUBMIT TO GOVERN- MENT	O D E		
- 	a.	D.		2-02	Lining Material	1.		n.	I.	j.	K.		m.	n.	0.		q.	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa
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TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				025	62	
SECTIO	N TITLE:	MON	NOLITHIC MANHOL	E SURFACING SYSTEM				TYPE	OF S	SUBM	ITTAL	-			CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G %	I N S T R U C T I O N S	80 1 1 1 0 0 1 1 1 8	S T A T E M E N T S	R E P O R T S	CERT-F-CATES	S A M P L E S	RECORDS	O & M M A N U A L S	I N F O R M A T N L Y	E V N E T D	R E V I E W E R	SUBMIT	BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
<u>a.</u>	b.	C.	1-04	Surfacing System	f.	g.	h.	I.	j.	k.	I.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
			1-04	Qualifications	+^						Х				X											
			1-04	Qualifications							^				^											
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 02602 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: SLIP-ON FLAT BOTTOM CHECK VALVE TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С S Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S S T D R Ε Ε 1.01 Check Valve X

(ER 415 1-10)

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				026	60	
SECTIO	N TITLE:	WA	TER DISTRIBUTION	ISYSTEM				TYPE	OF S	UBMI	TTAL					ASSI- ATION		5	CONTRACT			CONTRA ACTI	CTOR ON	GOVERNMEN		
A C T I V I T Y	TRANS- MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G S	- N S T R U C T - O Z S h	⊗СН Ш D ∪ L Ш ⊗ -	S T A T E M E N T S :	REPORTS	C E R T I F I C A T E S -	S A M P L E S m.	R E C O R D Ø ,	O & M M & D A L % o	N	G O V A P P R P N R O E V N E D T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	NEEDED BY	C O D E :	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.		Ductile Iron Pipe	X	g.	n.	I.	J.	K.	<u> </u>	m.	n.	0.	р. Х	q.	Г.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
		T	†	PVC Pipe	X										Х											
				Gate Valves	Х										Х											
			2-07	Fire Hydrants	Х										Х											
			2-07	Test Results	Х										Х											
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 02810 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: IRRIGATION SYSTEM TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО М O R D S Ε С R T A L S Ν L I N ΕV W 0 Α 0 L 0 Е E S G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Е Irrigation System ХХ 1-03 X Test Results Χ 1-03 Χ

(ER 415 1-10)

TITLE AN	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				028	30	
SECTION	N TITLE:	СНА	IN LINK FENCING	AND GATES				TYPE	OF S	UBM	ITTAL					ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN		
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f	D R A W - N G S d	- N S T R U C F - O Z S h	8 C H E D D L E 8 -	S T A T E M E N T S :	K E P O R H の ×	C	SAMPLESE.	RECORDS r.	0 % M M A Z D A L % o	I N F O R M A T O I N O L N Y	G O V E P R R R O V E N T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
а.	IJ.		1-04	Chain Link Fence	X		X	1.	J.	N.	1.	111.	11.	U.	<u>γ</u> .	ч.	1.	э.	ι.	u.	v.	w.	Χ.	у.	ζ.	da.
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(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				031	00	
SECTIO	N TITLE:	CON	NCRETE FORMWO	RK				TYPE	OF S	UBM	ITTAL				CLA FICA	ASSI- ATION			CONTRACT	OR ATES		CONTRA ACTI	ACTOR ON	GOVERNMEN		
A C T I V I T Y N O O	TRANS- MITTAL NO	I T E M NO	SPECIFICATION PARAGRAPH NUMBER	SUBMITTED	D A T A f.	D R A W - N G %	- N S T R U C T - O Z S h	8 C H E D D L E 8 -	S T A T E M E N T S :	R E P O R T 0 2	C	8 A M P L E 8 E	R E C O R D 8 6	O & M M A N U A L S o.	I N F O R M A T O N Y	G O V E P R P N M O E N E D T T	R E V I E W E R	SUBMIT	ВҮ	NEEDED BY	CODE	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 1-04	e. Formwork	f. X	g.	n.	I.	J.	K.	l.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	٧.	W.	X.	y.	Z.	aa.
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(ER 415 1-10)

CONTRACT NO.

CONTRACTOR

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 03200 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: CONCRETE REINFORCEMENT TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С Ν М Т S F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ТО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G Ν Ε Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S S S NY T D R Ε Ε 1-03 ХХ X Reinforcement

TITLE AND LOCATION

SPECIFICATION SECTION:

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				033	00	
SECTIO	N TITLE:	CAS	ST IN PLACE CONC	RETE				TYPE	OF S	UBM	ITTAL	-			CLA FICA	ASSI- ATION		,	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M N O		DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G S	- N S T R U C T - O Z S	опгсоп н о о	STATEMENTS	R = P O R + S	CERTIFICATES	8 A M P L E 8	и п с о и с о и	O & M M A Z D A L S	I N F O R M A T I O Y	G O V E P R N O V E N T D	R E V I E W E R	SUBMIT	APPROVAL	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 1-05	e. Materials	f. X	g.	h.	I.	j.	k.	I.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	٧.	W.	X.	y.	Z.	aa.
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 04810 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: UNIT MASONRY ASSEMBLIES TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν М 0 Т S F C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α Α Μ V NUMBER NO BY MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО М O R D S Ε С С R T A L S Ν L I N ΕV Α 0 L W 0 0 E S Т G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε Masonry Units 1-03 X 1-03 Wire Reinforcement Χ Χ 1-03 X Mortar Facing Brick 1-03 Χ 1-03 **Block Units** X

CONTRACTOR

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Pesoto County, Mississippi																				053	10	
SECTIO	N TITLE:	STE	EL DECK					TYPE	OF S	SUBM	IITTAI	-			CLA FICA	ASSI- ATION	_		CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G %	- x s + R U C + - 0 x s	801 000 1 08	STATEMENTS	R E P O R T S	C E R T I F I C A T E S	S A M P L E S	R E C O R D S	O & M M A Z D A L S	I N F O R M A T N L Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
а.	b.	C.	d. 1-03	Steel Deck	f. X	g. X	h.	1.	<u>j.</u>	K.	l.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
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(ER 415 1-10)

IIILE Ar	ND LOCATION	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				054	00	
SECTION	N TITLE:	COL	D FORMED METAL	FRAMING			-	TYPE	OF S	UBM	ITTAL	-			CLA FICA	SSI- TION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	D R A W - N G % d	- N S T R U C T - O Z S h	« С Н Ш D ∪ L Ш « ⊢.	STATEMENTS :	K E P O R T の k	C E R T I F I C A T E S I.	8 A M P L E 8 E	R E C O R D S n:	O & M M & D A L % o	I N F O R M A T O N Y D.	GOVAEPRRONDENTO.	R E V I E W E R (SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION CONTRACTOR SPECIFICATION SECTION: Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 05401 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: LIGHT GAUGE PRE-ENGINEERED STEEL TRUSSES TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С Ν М Т S F 0 C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ТО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 Е E S Т G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Ε 1-04 Steel Trusses ХХ X Χ 1-04 Χ Structural Calcs

(ER 415 1-10)

CONTRACT NO.

A C T I TR/V MII I N O	RANS- IITTAL NO b.	I T E M NO c.	AL FABRICATIONS SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e. Ladders	D A T A f.	D R A W I N G	N S T R U C T	TYPE S C H E D	OF S S T A T E M	RE	C E R T I	·		М	CLA FICA I N F	SSI- TION		S	CONTRACTO	OR ATES		CONTRA ACTIO	CTOR ON	0550 GOVERNMEN		
A C T I TR/V MII I N O	RANS- IITTAL NO	I T E M NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	A T	R A W - N	N S T R U C T	S C H E D	S T A T E	RE	C E R T I F		0	& M	FICA I N	TION		S	CONTRACTO	OR ATES		CONTRA ACTIO	CTOR ON			
C T TRANS MIT T Y N O	IITTAL NO	M N O c.	PARAGRAPH NUMBER d.	SUBMITTED e.	A T	R A W - N	N S T R U C T I	C H E D	T A T E	Е	E R T - F	S	1	& M	I N											
a	b.				f	S	0 N S	ULES	E N T S	P O R T S	CATES	A M P L E S	RECORDS	M A N U A L S	O R M A O N O N V	O	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
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(ER 415 1-10)

STER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 05521 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: PIPE AND TUBE RAILINGS TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ΤО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 G S E S E S Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S T D R Ε Ε 1-02 X Handrails

TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

CONTRACTOR

Facility, Desoto County, Mississippi 05530 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: GRATING AND FLOOR PLATES TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С S М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С С M R T A L S Ν L I N ΕV W Α 0 L 0 0 Е E S G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Е 1-02 Gratings X Χ 1-02 Χ X Χ Floor Plate

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				061	00	
SECTIO	N TITLE:	ROL	JGH CARPENTRY					TYPE	OF S	UBM	ITTAL				CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN		
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G % d	- N S T R U C T - O Z S b	8 C H E D D L E 8 L	STATEMENTS	к ш р О к т о к	C	8 A M P L E 8 E	R E C O R D S r.	O & M M A N U A L S o.	I N F O R M A T O I N O L N Y	G O V A P P R P N R O E V N T D	R E V I E W E R r.	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
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			Facility, D	Desoto County, Mississippi																				062	00	
SECTION	N TITLE:	FINIS	SH CARPENTRY					TYPE	OF S	UBM	ITTAL				CLA FICA	ASSI- ATION			CONTRACT	OR ATES		CONTRA	CTOR ON	GOVERNMEN		
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(ER 415 1-10)

CONTRACT NO.

IIILE AN	ID LOCATI	ON		k Wastewater Treatment												CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	esoto County, Mississippi																			066	10	
SECTION	N TITLE:	GLA	SS FIBER AND RES	SIN FABRICATIONS				TYPE	OF S	UBMI	TTAL			FI	LASSI- CATION			CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	ACTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M N	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W I N G S	- N S T R U C T - O N S	8 C H H D D L H 8	S T A T E M E N T S	R E P O R T S	C E R T I F I C A T E S	SAMPLES	R I I C I I C I C I C I C I C I C I C I	O I I N M F O M R A M N A A J T A I O S N	N E V L N E	W E	SUBMIT	BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 1-03	e. Fiberglass	f.	g.	h.	l.	j.	k.	l.	m.	n. (). p.	q.	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
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TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				066	20	
SECTION	N TITLE:	CAS	ST PLASTIC FABRIC	CATIONS				TYPE	OF S	UBM	ITTAL					ASSI- ATION			CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN		
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M NO o	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	D R A W I N G S a.	- N % T R U C F - O Z % h	⊗СНШО∪∟ш⊗	STATEMENTS i.	к п р О к т о к	CERTIFICATES	SAMPLESE.	R E C O R D S ri	O & M M A N U A L S o.	I N F O R M A T O L N P.	G O V A E P R P N R M O E V N E T D	R E V I E W E R r.	SUBMITI	APPROVAL	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
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CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 07212 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: BOARD AND BATT INSULATION TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α Μ V NUMBER NO BY MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ΤО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S Т G Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S S T D R Ε Е 1-03 **Board Insulation** X 1-03 Χ Χ Batt Insulation

CONTRACTOR

(ER 415 1-10)

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				076	10	
SECTIO	N TITLE:	SHE	ET METAL ROOFIN	NG			-	TYPE	OF S	UBM	ITTAL	-				ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	DRAWINGS d	- N S T R U C T - O N S b	8 C H E D U L E 8 L	S T A T E M E N T S i.	REPORTS	C	8 A M P L E 8 E	RECORDS r.	O & M M A N U A L S o.	I N F O R M A T O L N P.	G O V A E P R P N R M O E V N E T D	R E V I E W E R r.	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
			1-05	Sheet Metal Roofing	Х	X						X			X											
			1-05	Warranty	X										X											
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(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				076	31	
SECTIO	N TITLE:	GU ⁻	TTERS AND DOWN	SPOUTS			-	TYPE	OF S	UBM	ITTAL	-			CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.		DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	D R A W - N G % d	- N S T R U C T - O Z S b	осн п о о г п о г	STATEMENTS :	R E P O R T の と	CERT-F-CATES-	« А М Р L E « E .	R E C O R D S n.	O & M A N U A L S o.	I N F O R M A T O I N O L N Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R t	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
		Ŭ.	1-04	Gutters	Ë	X			,			X			X	1.		J.			Ë		34	j.		30.
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(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCAT	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				079	00	
SECTIO	N TITLE:	JOII	NT SEALERS					TYPE	OF S	UBM	ITTAL	-			CLA FICA	SSI- TION		Ş	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	T E M N O		DESCRIPTION OF ITEM SUBMITTED	D A T A f.	DRAW-NGS	- z s - z c o z s	8 C H H D D L H 8	S T A T E M E N T S	REPORTS	CERTIFICATES	S A M P L E S	RECORDS	O & M M A N U A L S	I N F O R M A T I O N L Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
<u>a.</u>	b.	C.	d. 1-02	Applicator Assurance	f. X	g.	h.	I.	j.	k.	I.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
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(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi													L							081	10_	
SECTIO	N TITLE:	STE	EL DOORS AND FF	RAMES				TYPE	OF S	SUBM	IITTAI	-			CLA FICA	ASSI- ATION		;	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W I N G S	I N S T R U C T I O N S	0 C H E D D L E 0	S T A T E M E N T S	R E P O R T S	C E R T I F I C A T E S	SAMPLES	R E C O R D S	O & M M A Z D A L S	N	G O A E P R P N R	R E V I E W E R	SUBMIT	APPROVAL	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
а.	b.	C.	d. 1-03	e. Steel Doors	f. X	g. X	h. X	I.	j.	k.	l.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	٧.	W.	X.	y.	Z.	aa.
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			1-04	Quality Assurance	 ^										٨											
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 08211 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: FLUSH WOOD DOORS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО М Ε С С R T A L S Ν L I N ΕV 0 Α 0 L W 0 G S E S Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S NY T D R Ε Ε ХХ 1-03 Wood Doors X X 1-03 Warranty Χ 1-04 Quality Assurance

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				083	60	
SECTIO	N TITLE:	OVE	RHEAD DOORS					TYPE	OF S	SUBM	IITTAI	-			CLA FICA	ASSI- ATION			CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M N O	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	DRAW-NGS	- x s - x - 0 c s - 0 z s	8 C H H D D L H 8	S T A T E M E N T S	R E P O R T S	CERTIFICATES	SAMPLES	RECORDS	O & M M A N U A L S	I N F O R M A T O I N O L N Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
<u>a.</u>	b.	C.	d. 1-03	Overhead Doors	f. X	g. X	h.	l.	j.	k.	I.	m.	n.	0. X	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
				Warranty	X										Х											
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(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				084	10	
SECTIO	N TITLE:	MET	TAL FRAMED STOR	EFRONTS				TYPE	OF S	UBMI	ITTAL					ASSI- ATION		(CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O O	TRANS- MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	SUBMITTED	D A T A f.	D R A W - N G S a	- N S T R U C T - O Z S &	8 C H E D D L E 8 -	S T A T E M E N T S :	REPORTS	C	8 A M P L E 8 E	R E C O R D S n.	O & M M A N U A L S o.	I N F O R M A T O L Y N Y	G O A P P R P N M O E N T D	R E V I E W E R	SUBMIT	BY	NEEDED BY	CODE	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
а.	b.	C.	1-04	Storefronts	T. X	g. X	11.	l.	j.	K.	X		n.	0.	р. Х	q.	Г.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
			1-04	Test Results	Х	П									Х											
				Warranty	X										X											
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(ER 415 1-10)

CONTRACT NO.

	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				085	20	
SECTION	N TITLE:	ALUI	MINUM WINDOWS					TYPE	OF S	SUBM	IITTAI	-			CLA FICA	ASSI- ATION			CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A	DRAW-NGS	- x s - x - 0 c s	0 U H U O U L U 0	STATEMENTS	R E P O R T S	C E R T I F I C A T E S	SAMPLES	RECORDS	O & M M A N U A L S	I N F O R M A T O L N Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 1-04	e. Aluminum Windows	f.	g. X	h. X	I.	j.	k.	Т. Х	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
			1-04	Test Results	х						Ť				X											
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 08710 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: DOOR HARDWARE TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО М Ε С R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G S E S Т Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S T D R Ε Ε 1-03 Door Hardware X 1-03 Warranty Χ Χ 1-03 Quality Assurance X

CONTRACTOR

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 08800 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: GLAZING TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО М Ε С С R T A L S Ν L I N ΕV W Α 0 L 0 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S S T D R Ε Е 1-04 X X Glazing Quality Assurance 1-05 Χ Χ 1-07 Warranty

(ER 415 1-10)

TITLE AN	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				092	60	
SECTION	N TITLE:	GYP	SUM BOARD ASSE	EMBLIES				TYPE	OF S	UBM	ITTAL	-			CLA FICA	ASSI- ATION			CONTRACT	OR ATES		CONTRA	ACTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O O	TRANS- MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A S - Z G % g	N S T R U C T O N S h.	8 C H E D U L E 8 -	S T A T E M E N T S :	к ш р О к н ю к	C E R T I F I C A T E S -	8 A M P L E 8 E.	RECORD% r.	O & M M A Z D A L % o	I N F O R M A T O L N Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL	MATERIAL NEEDED BY	C O D E v.	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.		Metal Framing	X	y.	11.	1.	J.	N.	I.	III.	11.	U.	р. Х	ų.	1.	S.	l.	u.	V.	W.	X.	у.	Z.	aa.
				Gypsum Board	Х										Х						1					
			1-03	Accessories	X										X											
			1-03	Joint Finishing	Х										Х											
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 09511 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: SUSPENDED ACOUSTICAL CEILINGS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ΤО МО М O R D S Ε С С R T A L S Ν L I N ΕV W 0 Α 0 L 0 Е E S Т G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 Α S S S S S T D R Ε Е 1-03 Accoustical Ceiling X X Χ 1-04 Quality Assurance Χ

(ER 415 1-10)

TITLE AN	ND LOCATI	ON	Short For	k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				096	50	
SECTION	N TITLE:	RES	ILIENT FLOORING				1	TYPE	OF SI	UBMI	TTAL				CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O a.	TRANS-MITTAL NO b.	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G S a	I NSTRUCTIONS h	SCHEDULESL	S T A T E M E N T S :	R E P O R T	C E R T I F I C A T E S I	S A M P L E S m.	R E C O R D S n	O & M M A N D A L S o	I N F O R M A T I O N P.	G O V A P P R P N R O E V N T D	R E V I E W E R	SUBMIT	APPROVAL	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E	DATE z.	REMARKS aa.
a.	J.			Resilient Flooring	X	я.			J·	IX.		X		X	X	ч.		. J.	ι.	u.	V.	**.	^.	у.	۷.	ua.
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

CONTRACTOR

				Desoto County, Mississippi																				0968	30	
SECTIO	N TITLE:	CAR	PET					TYPE	OF S	SUBM	ITTAL	-			CLA FICA	SSI- TION		5	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	T ACTION	
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	DRAWINGS g.	- N % T R U C T - O N % k.	осн по о т по т	S T A T E M E N T S :	REPORTSk	CERT-F-CATES-	SAMPLESE	R E C O R D o e	M M A N U A L S o.	I N F O R M A T O N Y p.	GOVAEPRRRMOEVNETO	REVIEWER r.	SUBMIT	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT X.	C O D E y.	DATE z.	REMARKS aa.
			1-03	Carpet	Х									X	Χ											
	<u> </u>		1-04	Quality Assurance	X										X											<u> </u>
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TITLE AND LOCATION

(ER 415 1-10)

TITLE AI	ND LOCATI	ION	Short For	k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				099	00	
SECTIO	N TITLE:	PAIN	NTS AND COATING	es			1	ΓΥΡΕ	OF SI	UBMI	TTAL					ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	DRAWINGS a	N S T R U C T O N S h	S C H E D U L E S L	Т	R E P O R T	C E R T I F I C A T E S I	S A M P L E S E.	RECORDS r.	O & M M A N U A L S o.	I N F O R M A T I O N P.	G O V A E P R P N R M O E V N E T D	REVIEWER	SUBMIT	APPROVAL	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E	DATE z.	REMARKS aa.
	<u> </u>	J.	1-04	Paints	X	. a.			<u>'</u>			X		J.	X	4.		J.		<u> </u>	Ť.	"	Λ.	J.	<u>-</u> .	au.
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 10100 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: VISUAL DISPLAY BOARDS TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ΤО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S S T D R Ε Е 1-03 Visual Display Board X 1-04 Warranty Χ Χ

(ER 415 1-10)

TAL REGISTER CONTRACT NO.

CONTRACTOR

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			Facility, L	esoto County, Mississippi																				101	71	
CTIC	N TITLE:	SOL	LID PLASTIC TOILE	COMPARTMENTS				TYPE	OF S	SUBM	IITTAL	-			CLA FICA	ASSI- ATION		;	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N	TRANS- MITTAL NO	I T E M	NOWBER	DESCRIPTION OF ITEM SUBMITTED	D A T	D R A W - N G	I N S T R U C T I O N	о п п с о п н о о	STATEMENT	REPORTS	CERTIFICATES	S A M P L E S	R E C O R D	M M A N U A L	F O R M A O N L	E V N E	V I E W E	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	СОО	DATE	SUBMIT TO GOVERN- MENT	C O D	DATE	REMARK:
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a.	D.	C.	1-02	Toilet Compartments		X		1.	J.	N.	1.	111.	11.	0.	χ. X	q.	1.	5.	ι.	u.	٧.	w.	Χ.	у.	Ζ.	aa.
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TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

	ID LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	I SECTION:	
			Facility, D	esoto County, Mississippi																				104	46	
SECTION	N TITLE:	PLAS	STIC SIGNS					TYPE	OF S	SUBM	ITTAL				CLA FICA	SSI- TION		S	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN		
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	D R A ⊗ − N G % g;	- N S T R U C T - O Z S h	ост по о п п о т	STATEMENTS	R E P O R T S k	C E R T - F - C A T E S -	8 A M P L E 8 E	R E C O R D S n.	O & M M A N U A L S o	I N F O R M A T O N L Y p.	G O V A P R P N R O E V N E T D q.	R E V I E W E R r.	SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
			1-03	Plastic Signs		X						X			X											
			1-04	Quality Assurance	X										X											
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(ER 415 1-10)

	ID LOCATI	OIN		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	I SECTION:	
			Facility, D	esoto County, Mississippi																				105	00	
SECTION	N TITLE:	LOCI	KERS					TYPE	OF S	UBM	ITTAL					ASSI- ATION			CONTRACT	OR ATES		CONTRA	CTOR ON	GOVERNMEN		
A C T I V I T Y	TRANS-MITTAL NO	I Т Е М Х О с.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	DRAWINGS g	- Z S F R U C F - O Z S k	« С Н Ш D О L Ш »	S T A T E M E N T S j.	R E P O R T S k	C	S A M P L E S m.	RECORDS r.	0 % M M A Z D 4 L 0 o	I N F O R M A T N L Y p.	G O V A E P R P N R M O E V N E T D	R E V – E W E R r:	SUBMIT	APPROVAL	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
			1-04	Lockers	X										X											
			1-04	Accessories	Х										Χ											
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

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			racility, L	Desoto County, Mississippi																				105	23	
SECTIO	N TITLE:	FIRE	EEXTINGUISHERS	, CABINETS AND ACCESSORIES				TYPE	OF S	SUBM	ITTAL	•			CLA FICA	SSI- TION		5	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	ACTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T	D R A W I N G	- N S T R U C F - O Z	осн п о о п п	S T A T E M E N T	R E P O R T	CERTIFICATE	S A M P L E	R E C O R	&	M A T O	G O V E R N M E N	R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	COD	DATE	SUBMIT TO GOVERN- MENT	C O D	DATE	REMARKS
0		0			Α	G S	N S	S	S	S	E S	E S m.	S	S	ΝΥ	T D	R				Е			E		
a.	b.	C.	d. 1-03	Fire Extinguishers	f. X	g.	h. X	I.	j.	k.	I.	m.	n.	0.	р. X	q.	r.	S.	t.	u.	٧.	W.	X.	у.	Z.	aa.
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			1-03	Cabinets	X		X							_	Х											
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CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 10800 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: TOILET, BATH AND LAUNDRY ACCESSORIES TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С S Ν М Т S F 0 C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α Μ V NO NUMBER BY MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО М O R D S Ε С R T A L S Ν L I N ΕV Α 0 L W 0 0 E S Т G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε 1-03 X **Toilet Accessories** 1-03 Bath Accessories Χ Χ 1-03 Laundry Accessories

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 11450 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: RESIDENTIAL EQUIPMENT TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E ΕP R F S М Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ТО МО М Ε С С R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε Refrigerator 1-03 X X 1-03 Χ Χ Dishwasher 1-04 Quality Assurance X X 1-05 Warranty Χ

CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				116	00	
SECTIO	N TITLE:	WAS	STEWATER LABOR	ATORY EQUIPMENT				TYPE	OF S	SUBM	IITTAI	-			CLA FICA	ASSI- ATION		ş	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A W - N G %	- x s + R U C + - O z s	801100118	STATEMENTS	REPORTS	C E R T I F I C A T E S	8 A M P L E 8	RECORDS	O ~ M M A Z D A L S	I N F O R M A T N L Y	E V N E T D	R E V I E W E R	SUBMIT	BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 2-02	Laboratory Equipment	f.	g.	h.	I.	j.	k.	I.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	٧.	W.	X.	y.	Z.	aa.
			2-02	Laboratory Equipment	 ^										^											
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(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	I SECTION:	
			Facility, D	Desoto County, Mississippi																				123	11	
SECTIO	N TITLE:	MET	AL CASEWORK					TYPE	OF S	SUBM	ITTAL				CLAS	SSI- TION			CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A	D R A W - N G %	- N S T R U C T - O Z S	8011001188	STATEMENTS	R E P O R T S	CERTIFICATES	SAMPLES	R E C O R D S	M A N U A L S	F O R M A T O I N O L N	G O V E R R O V E D	R E V I E W E R	SUBMIT	BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 1-04	Metal Casework	f. X	g. X	h.	I.	j.	k.	l.	m. X	n.	0.	р. X	q.	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
			1-05	Qualifications	X							-		1	X						T					
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 13121 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: PRE-ENGINEERED BUILDINGS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO BY MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО М Ε С С R T A L S Ν L I N ΕV Α 0 L W 0 0 E S Т G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε 1-04 Metal Building Χ X Quality Assurance 1-05 Χ Χ 1-06 Warranty X

CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

STER CONTRACT NO.

CONTRACTOR

			Facility, D	Desoto County, Mississippi																				133	10	
SECTIO	N TITLE:	ELE	CTRICAL, INSTRUM	MENTATION AND CONTROLS			•	TYPE	OF S	SUBM	ITTAL	_				ASSI- ATION		Ş	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTIO	CTOR ON	GOVERNMEN	T ACTION	
A C T I V I T Y	TRANS- MITTAL NO b.	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	D R A & — Z G % d	- Z O O C Z + O Z -	- опгоопноо	0 I Z I Z I I V I O	к п р О к н ю к	- O H H P O - H - H B H O	э о д д ь о	к п с о к о к	O & M M A N U A L S o.	I N F O R M A T I O N P.	G O V A E P R P N R M O E V N E T D	R E V I E W E R t	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E >:	DATE w.	SUBMIT TO GOVERN- MENT	C O D E v	DATE z.	REMARKS aa.
				Controls		X			,					X	·	X								,		
			2-01	Qaulity Assurance	X										Χ											İ
			2-01	Warranty	Х										Χ											
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TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

REGISTER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 13350 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: EXTERIOR ELECTRICAL BUILDING TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 G S E S E S Т Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S T D R Ε Ε 1-02 Χ **Electrical Building** X

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

L REGISTER CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 15100 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: PIPE SUPPORTS AND HANGERS TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С S Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ΤО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G S E S Т Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S T D R Ε Ε Χ 1-03 Pipe Hangers X

(ER 415 1-10)

CONTRACT NO.

15117	N:	SECTION:	SPECIFICATION						ACTOR	CONTR												k Wastewater Treatment		ON	D LOCATION	TITLE A
A C C T TRANS- TRA		17	151 ⁻																			esoto County, Mississippi	Facility, D			
A C T T TRANS- V MITTAL T TRANS- V MITTAL T NO	N	IT ACTION	GOVERNMEN	ACTOR ON	CONTRA ACTIO		OR ATES	CONTRACT	S		ASSI- ATION	CLA FICA			TAL	JBMIT	OF SI	TYPE				SS STEEL SLIDE GATES	BRICATED STAINLE	FAB	TITLE:	SECTIO
1-04 Slide Gates X X X X			O D E	GOVERN- MENT		O D E	NEEDED BY	NEEDED BY		E > - E & E	O	F O R M A O N L Y	& M M A N U A L s	E C O R D S	E R T I S A C M P L E S S	R E P O R T	T A T E M E N T	СНШООГШ	N S T R U C T I O N	R A W I N G	A T	SUBMITTED	PARAGRAPH NUMBER	E M N O	MITTAL NO	C T I V I T Y
1-06 Quality Assurance X X	aa.	Z.	у.	X.	W.	V.	u.	t.	S.	r.		p.		. n.	l. m.	k.	j.	I.	h.	g. X	f. X		1-04	C.	b.	a.
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(ER 415 1-10)

STER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 15118 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: TELESCOPING (SLIP SEAL) VALVES TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν s c М 0 Т F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α Α Μ V NUMBER NO BY MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО M O R D S Ε С С R T A L S Ν L I N ΕV W 0 Α 0 L 0 E S G S E S Т Ν Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S NY T D R Ε Ε 1-04 Χ X Telescoping Valves 1-06 Quality Assurance Χ Χ 3-02 Test Results X

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 15119 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: ALUMINUM SLIDE GATES TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С S s c М Т 0 F R V A A T TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н М ΕP R F S R E C O R D S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ Ν NR U E N T 0 A T Р U ΤО МО М Ε С С R T A L S Ν L I N ΕV W 0 Α 0 L 0 G S E S E S Т Ν Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S T D R Ε Е 1-03 Waste Sludge Valve X Χ 1-03 Motor Operator Χ

CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

TITLE AN	ID LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				151	20	
SECTION	N TITLE:	ALU	MINUM SLIDE GAT	ES			1	TYPE	OF S	SUBM	ITTAL					SSI- TION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	SUBMITTED	D A T A	DRAWINGS	- N S T R U C T - O N S .	» с н н D ∪ ∟ н » .	S T A T E M E N T S .	R ЕРОR ⊤ S .	C	% ∀ ₹ ₽ ∟ ⊞ %	R E C O R D S	O & M M A N U A L S	I N F O R M A T O I N O L N Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
<u>a.</u>	b.	C.	d. 1-02	Slide Gates	f. X	g. X	h.	I.	j.	k.	I.	m.	n.	O.	p.	q. X	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
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(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				151	73	
SECTIO	N TITLE:	PAR	SHALL FLUME					TYPE	OF S	UBM	ITTAL				CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN		
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A S - N G S s	- N S T R U C T - O Z S h	8 C H E D D L E 8 -	S T A T E M E N T S :	R E P O R T の ,	C	8 A M P L E 8 E	R E C O R D S ri	O & M M A N U A L S o.	I N F O R M A T O N Y D	G O V A P P R P N M O E N E D T C	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	NEEDED BY	C O D E v.	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	Ο.		1-02	Parshall Flume	T. X	<u>g.</u>	H.	1.	J.	K.	l.	m.	n.	о. Х	ρ.	q. X	Г.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
				2 /2 / 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2 /	 																					
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 15174 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: ULTRASONIC FLOW METER TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν s c М Т F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV 0 Α 0 L W 0 G S Е E S Ν Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S NY T D R Ε Ε 1-04 Χ X Flow Meter

CONTRACTOR

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 15244 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: PRESTRESSED COMPOSITE TANKS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С S Ν М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α Μ V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО М O R D S Ε С С R T A L S Ν L I N ΕV Α 0 L W 0 0 Е E S G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Ε Company Experience 2-01 X 3-01 Warranty Χ 5-01 Composite Tanks XX X

CONTRACTOR

(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				152	62	
SECTIO	N TITLE:	ULT	RAVIOLET DISINFE	ECTION EQUIPMENT				TYPE	OF S	SUBM	ITTAL					ASSI- ATION		(CONTRACT			CONTRA	ACTOR ON	GOVERNMEN		
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A & - N G % c	- N S T R U C T - O Z S h	осппоппο-	STATEMENTS:	と 田 P O R T の ょ	C	8 A M P L E 8 E	R E C O R D S n	O & M M A Z D A L % o	I N F O R M A T O I N O I N O I	G O V E P R R O E N E D T D	REVIEWER	SUBMIT	APPROVAL	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E V.	DATE z.	REMARKS aa.
и.	D.	0.		Quality Assurance	X	g.			,	κ.				0.	X	Ч.		0.	ι.	u.	, ·	**.	Α.	J.	<u> </u>	uu.
				Disinfection Equip.	Х	Х	Х							Х		Х										
				Electrical Schematics		X									Х										1	
				Guarantee	X										Х											
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(ER 415 1-10)

TITLE A	ND LOCATION	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				153	50	
SECTIO	N TITLE:	INFL	LUENT PUMPING S	TATION				TYPE	OF S	SUBM	ITTAL					ASSI- ATION		5	CONTRACT			CONTRA ACTI	ACTOR ON	GOVERNMEN		
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	DRAW-NGS	- N N T N U N T N N N N N N N N N N N N N	0 C H H D D L H 0 -	S T A T E M E N T S :	R E P O R T S	C	8 A M P L E 8 E	R E C O R D S i	O & M M A N U A L S	I N F O R M A T O I N O I N O I V	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E :	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	1-02	Pumping Station	T. X	g. X	n.	1.	J.	K.	I.	m.	n.	0.	p.	q. X	Г.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
			1	Sewage Pumps	X									Х		Х										
				Pump Tests	X	^					Х			^	Х	_					<u> </u>					
				Quality Assurance	X						_				X											
				adding 7 toodirance	1																					
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(ER 415 1-10)

REGISTER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 15351 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: EFFLUENT PUMPS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С М Т S F 0 C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E ΕP R F S М Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S Т G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε X 1-02 Effluent Pumps Test Results 1-02 Χ 1-05 Manuf. Qualifications X X 1-09 Warranty Χ

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

CONTRACTOR

				esoto County, Mississippi																				153	F0	
SECTION	TITLE:	SCU	M PUMPING STATI	ON				TYPE	OF S	SUBM	ITTAI	_				ASSI- ATION			CONTRACT	OR		CONTRA	CTOR	GOVERNMEN		
A C T I V I T	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A	D R A W I N	I N S T R U C T I O	S C H E D U L	S T A T E M E N	R E P O R	C E R T I C A T	S A M P L	RECOR	O & M M A N U A	I N F O R M A T O I N	G O A E P R P R M O E V	E V I E W	SUBMIT	APPROVAL	MATERIAL NEEDED BY	CO	DATE	SUBMIT TO GOVERN- MENT	C 0	DATE	REMARKS
N O		N O			T A	G S	N S	S	T S	T S	E S	E S	D S	L S							D E			D E		
a.	b.	C.	d. 1-02	e. Scum Pumps	f.	g. X	h.	I.	j.	k.	I.	m.	n.	0. X	p.	q. X	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
			1-02	Test Results	X									Ĥ	х	 ^`										
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TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

	10 200/111		Engility F	Noote County Mississippi													00	10101010						or Eon loveron		
			racility, L	Desoto County, Mississippi																				153	53	
CTIO	N TITLE:	SUB	MERSIBLE CHOPF	PER PUMPS				TYPE	OF S	SUBM	ITTAL				CLA FICA	ASSI- ATION		,	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	ACTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T	D R A W I N G	- z o - z o c z - o z	мгсошном	STATEMENT	REPORT	CERTIFICATE	SAMPLE	R E C O R D	M M A N U A	I N F O R M A T I O L	G O V A E P R P R P N C E V N E V	R E V I E W E	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	COD	DATE	SUBMIT TO GOVERN- MENT	C O D	DATE	REMARK
0		0			Α	G S	N S	S	S	S	E S	E S m.	D S		NY	T D	R				Е			E		
a.	b.	C.	d. 1-02	Chopper Pumps	f.	g. X	h.	I.	j.	k.	l.	m.	n.	0. X	p.	q. X	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
			1-02	Test Results	X										Х	<u> </u>										
			1-02	Warranty	X										X											
			1-02	Performance Affidavit											X											
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CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 15381 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: MECHANICAL BAR SCREEN TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО М O R D S Ε С С R T A L S Ν L I N ΕV Α 0 L W 0 0 G S Е E S Т Ν Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S NY T D R Ε Ε X 1-05 Mech. Bar Screen 1-06 Quality Assurance Χ Χ 1-09 Warranty X

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

			Engility F	Desoto County, Mississippi																						
			racility, L	Desoto County, Mississippi																				153	32	
ECTION	I TITLE:	HYD	RAULIC REMOVAL	CLARIFIERS			٦	TYPE	OF S	UBMI	TTAL				CLA FICA	SSI- TION		5	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	ACTOR ON	GOVERNMEN	IT ACTION	
A C T V T Y N	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T	D R A W - N G	- N S T R U C T - O N	8 C H E D U L E	S T A T E M E N T	R E P O R	I C A T	P L	R E C O R	& M M A N U A	M A	G O V E R N M E N	R E V E W E	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	СОО	DATE	SUBMIT TO GOVERN- MENT	C O D	DATE	REMARK
0	L	O c.			A	G S	N S h.	S	S	S	E S	E S m.	S	S 0.	NY	T D	R				E v.			E v.	_	
a.	b.		d. 1-02	Qualifications	X	g.	n.	1.	J.	K.	1.	m.	n.		р. Х	q.	ı.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
			1-03	Clarifiers		Х					Х			х		Х										
			1-03	Test Results	X						$\stackrel{\sim}{+}$	-			Χ											
			1-05	Warranty	Х										Χ											
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CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

EGISTER CONTRACT NO.

CONTRACTOR

				Desoto County, Mississippi																						
					l										CL	ASSI-			CONTRACT	OR	I	CONTRA	CTOR	1538		
SECTIO	N TITLE:	CLA	RIFIER ALGAE SW	EEP			1	TYPE	OF S	SUBM					FICA	ATION			SCHEDULE D	ATES		ACTI	ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T	D R A W I N G	I N S T R U C T I O N	SCHEDULES	S T A T E M E N T	R E P O R T	CERTIFICATE	S A M P L	R E C O R D S	O & M M A N U A L	N F O R M A T O N O L	E V N E	R E V I E W E	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	COD	DATE	SUBMIT TO GOVERN- MENT	C O D	DATE	REMARKS
O a.	b.	O c.	d.	e.	A f.	S g.	S h.	S I.	S j.	S k.	S I.	S m.	S n.	S 0.	N Y p.	T D q.	R r.	s.	t.	u.	E v.	w.	X.	Е у.	Z.	aa.
			1-02	Algae Sweep	X	X								X		X										
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TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				153	84	
SECTIO	N TITLE:	SCR	EW PUMP EQUIPM	MENT				TYPE	OF S	SUBM	IITTAL	-			CLA FICA	SSI-			CONTRACT			CONTRA ACTI	ACTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A	D R A W I N G S	I N S T R U C T I O N S	801100118	STATEMENTS	REPORTS	CERTIFICATES	8 A M P L E 8	RECORDS	A N U A L S	I N F O R M A T O I N O U	G O V E P R R R O V E N E D T D	R E V E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 1-04	e. Manuf. Qualifications	f. X	g.	h.	I.	j.	k.	I.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
		t		Screw Pump	X									х		Х										
		1	1-04	Lubrication System	X									X		X										
					 																					
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(ER 415 1-10)

TITLE A	ND LOCAT	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				153	36	
SECTIO	N TITLE:	GRI ⁻	T REMOVAL SYSTE	ΕM			1	TYPE	OF S	UBM	ITTAL				CLA FICA	ASSI- ATION		S	CONTRACT	OR ATES		CONTRA	CTOR ON	GOVERNMEN		
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	DRAWINGS a	N S T R U C T O N S h	8 C H E D U L E 8 -	S T A T E M E N T S ;	к ш р О к н ю х	C	8 A M P L E 8 E	R E C O R D S n.	O & M M A N U A L S o.	I N F O R M A T O I N O L N Y	G O V A E P R P N R M O E V N E T D	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E	DATE z.	REMARKS aa.
u.	J.	Ü.	1-01	Grit Removal System	X		X		j.	14.		111.		X	ρ.	X		J.		u.	·-	**.	Χ.		2.	uu.
			3-03	Warranty	Х										Х											
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(ER 415 1-10)

TITLE AN	ID LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				153	90	
SECTION	N TITLE:	AER	ATION BASIN SPE	CIFICATIONS			1	TYPE	OF S	SUBM	ITTAL				CLA FICA	SSI- TION		5	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f	D R A & - N G % a	- N S T R U C F - O Z S h	оппсоппо°	STATEMENTS:	К E P O R T % ;	C	8 A M P L E 8 E	R E C O R D S n	O & M M A N U A L S o	I N F O R M A T I O Y p.	G O V E R N M E N T	REVIEWER	SUBMIT	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY	C O D E v.	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
<u>a.</u>	b.		d. 1-03	Aeration Basin	X		n.	ı.	J.	K.	I.	m.		X	p.	q. X	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
				Warranty	х										Х											
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 15391 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: LOW PROFILE PACKAGED CASCADE AERATOR TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С Ν М Т S F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ТО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 Е E S Т G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Е 4-01 Cascade Aerator X 5-01 Χ Guarantee Χ

CONTRACTOR

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 15392 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: HYDRAULIC GRINDER WITH ROTATING SCREENS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С М Т S F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RР Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G Ν Ε Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S S S NY T D R Ε Ε ХХ X 1-05 Hydraulic Grinder Manuf. Qualifications 1-02 Χ Χ

CONTRACTOR

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

	TD LOOM		Eacility D	esoto County, Mississippi														0.0101						or Lon loverion		
			racility, D	esoto County, Mississippi																				153	93	
SECTIO	N TITLE:	SLU	DGE BELT FILTER	PRESS				TYPE	OF S	SUBM	ITTAL	-			CLA FICA	SSI- TION			CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T	D R A W I N C	I N S T R U C T I O N	SCHEDUL	S T A T E M E N T	R E P O R T	CERTIFICAT	S A M P L	R E C O R	M A N U A	I N F O R M A T I O L	G O V A P R P N R M O E V	R E V I E W L	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	COD	DATE	SUBMIT TO GOVERN- MENT	C	DATE	REMARKS
N O		N O			A f.	G S	N S	E S	S		E S	E S	S	s	ΝΥ	N E T D	E R				D E			D E		
a.	b.	C.	d. 1-09	Filter Press	f. X	g.	h.	I.	j.	k.	I.	m.	n.	о. Х	p.	q. X	r.	S.	t.	u.	٧.	W.	Χ.	у.	Z.	aa.
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			1-07	Warranty	X								+	-	X											
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CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 15394 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: CENTRIFUGAL BLOWER TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV W 0 Α 0 L 0 Е E S G Ν Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε 1-03 Centrifugal Blower Χ X ХХ

(ER 415 1-10)

REGISTER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 15395 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: POLYMER SYSTEM TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Е ХХ X 1-02 Polymer System 3-02 Warranty Χ Χ

TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

TITLE A	ND LOCATI	ON	Short For	k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				153	96	
SECTIO	N TITLE:	AER	OBIC DIGESTER				-	TYPE	OF S	UBM	ITTAL	<u>.</u>				ASSI- ATION		5	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	ACTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	D R A W - N G % d	- N S T R U C T - O Z S b	осн п о о г п о г	STATEMENTS :	R E P O R T の k	CERTIFICATESL	S A M P L E S E.	R E C O R D % r.	O & M M A Z U A L % o.	I N F O R M A T O I N O L N Y	GOVAEPRRRMOEVNETO	R E V I E W E R t	SUBMIT	APPROVAL		C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
<u>.</u>	Ž.		1-04	Aerobic Digester	X		X		j.					X	ν.	X		Ŭ.		<u></u>		•••		J.		
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(ER 415 1-10)

ER CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 15397 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: SHAFTLESS-SCREW SLUDGE CONVEYOR TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S Т G Ν Ε Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S S S NY T D R Ε Ε 2-18 Screw Conveyor ХХ X

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 15398 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: VERTICAL PROGRESSING CAVITY PUMPS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S Ν М Т S F 0 C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Е Cavity Pump ХХ X 1-03 3-02 Test Results Χ Χ

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 15400 CONTRACTOR CONTRACTOR CLASSI-GOVERNMENT ACTION SECTION TITLE: PLUMBING TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С М Т S F 0 C R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E ΕP R F S М Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е Α С Ε Α Α Μ RΡ V NO NUMBER MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С С M R T Ν L Α I N ΕV Α 0 L W 0 0 E S L S G Ν Ε Т Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S S NY T D R Ε Ε 1-06 Cleanouts X 1-06 Valves Χ Χ 1-06 Pipe Hangers X 1-06 Pipe Insulation Χ 1-06 Χ Piping 1-06 Water Heater 1-06 Hose Reels Χ X 1-06 Air Compressor X X 3-14 **Test Results** X Χ

CONTRACTOR

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

CONTRACT NO.

SECTION TITLE: A C T I TRAN: WITTA NO Y N O a. b.	NS- FAL T D E M	SPECIFICATION PARAGRAPH NUMBER	esoto County, Mississippi G AND AIR CONDITIONING DESCRIPTION OF ITEM SUBMITTED	DA	D R A W	I N S T R U C	s с н	S T A T		C E R T			O &	CLA FICA	SSI- TION		s	CONTRACT			CONTRA ACTIO		1580 GOVERNMEN		
A C T T TRANS V MITTA NO Y N O	NS- FAL T D E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	Α	R A W	I N S T R U	s с н	S T A		C E R T	-						S								
C T TRANS	TAL TO E	PARAGRAPH NUMBER N	SUBMITTED	Α	R A W	S T R U	C H	T A		E R T				I	TION			CHEDULE D	TILO						
a. 0.		J. a.		T A	- Z G % a	T - O N S .	шоυ∟шо-	- E M E N F 0	R E P O R T % k	F I C A T E S	S A M P L E S m.	R E C O R D S	M A N U A L S	N F O R M A T - O N L Y	G O V E P P R N O V E D T 1	R E V I E W E R r	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE:	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
			e.	T.	g.	n.	I.	J.	K.	I.	m.	n.	0.	p.	q.	r.	S.	t.	u.	V.	W.	Χ.	у.	Z.	aa.
			Wiring Diagrams		X										X										
	_		Heat Pump	X	X								X		X										
			Flexible Duct		X								v		X										
			Unit Heater Temperature Controls	X							-		X		X										
			Heat Pump AHU	X									Х		X										
			Insulation	X	X								^		X										
	-		Diffusers, Grilles	X											X										
			Registers & Louvers		X										X										
		1-07	Hangers & Supports	X	X										X										-
		1-07	Test/Balance Agent	X											X										
			Fans	X	X								Х		Х										
-			Roof Curbs	Х											Χ										
			Guarantees	Х										Χ											
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(ER 415 1-10)

TITLE A	ND LOCATI	ON	Short For	k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				160	10	
SECTIO	N TITLE:	ELE	CTRICAL GENERA	L REQUIREMENTS			-	TYPE	OF S	UBM	ITTAL	-				ASSI- ATION			CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	D R A W - N G % d	- N S T R U C T - O N S b	8 C H E D U L E 8 L	STATEMENTS	REPORTS	C	S A M P L E S E.	RECORDS n.	O & M M A Z U A L % o.	I N F O R M A T O I N O L N Y	GOVAEPRRRMOEVNETO	R E V I E W E R r.	SUBMITI	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
				Electrical System	X		X							X		X								,		
			1-04	Test Results	X										X											
			1-09	Guarantee	Х										Х											
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(ER 415 1-10)

TITLE A	ND LOCATION	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				160	30	
SECTIO	N TITLE:	ELEC	CTRICAL SYSTEMS	S SCHEDULE				TYPE	OF S	SUBM	ITTAL				CLA	SSI-			CONTRACT			CONTRA		GOVERNMEN		
A C T							I N S T R	s C	S		C E R T			O & M	I N F O	G O V A	-					7,011				
V I T Y N O a.	TRANS- MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A	D R A W I N G S a	U C T I O N S h	O H H D D L H 0 -	ATEMENTS:	REPORFO	F I C A T E S	S A M P L E S m.	E C O R D	A N U A L	ORMATOLY	х	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT x.	C O D E	DATE z.	REMARKS aa.
а.	D.		1-02	Secondary Under-	1.	y.	11.	ļ. 	_j.	N.	١.	111.	11.	0.	ρ.	ų.	1.	5.	ι.	u.	v.	W.	Х.	у.	Ζ.	dd.
			-	Ground Service	X	Х						1	\dashv	х		Х										
			1-02	Standby Power										Х		Χ										
				Generator System	Х	Х								Х		Х										
			1-02	Power Distribution	Х	Х								Х		Χ										
			1-02	Lighting System	Х	Х								Х		Χ										
			1-02	Grounding System	X	X								Х		Х										
			1-02	Telephone System		X								X		Χ										
			1-02	Raceway System	Х	Х								Х		Х										
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(ER 415 1-10)

GISTER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 16050 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: BASIC MATERIALS AND METHODS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С Ν М Т S F 0 С R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ТО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S G S E S Т Ν Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S NY T D R Ε Ε 1-04 Mechanical Sleeve 1-04 Seals Χ 1-04 Coordination Drawings X

TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				160	60	
SECTION	N TITLE:	GRO	DUNDING				7	ГҮРЕ	OF S	UBMI	TTAL					ASSI- ATION		5	CONTRACT	OR ATES		CONTRA	CTOR ON	GOVERNMEN		
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A	DRAW-NGS	I N S T R U C T I O N S	SCHEDULES	S T A T E M E N T S	R E P O R T S	C E R T I F I C A T E S	S A M P L E S	RECORDS	O & M M A N U A L S	I N F O R M A T I O L Y	E V N E T D	R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
а.	b.	C.	d. 1-02	e. Grounding Rods	f. X	g.	h.	I.	j.	k.	l.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	٧.	W.	X.	у.	Z.	aa.
		╂—	1-02 1-02	Connectors	X		_	\dashv	\dashv	\dashv	_	\dashv			X						├					
		\vdash	1-02	Fittings Qualification Data	X		-	\dashv	\dashv	-	-	\dashv			X						\vdash		 			
		1	1-02	Test Results	X										X				<u> </u>				 			
			1-02	T C St T C Suits	 ^																					
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 16070 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: HANGERS AND SUPPORTS TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N T 0 A T Р U ΤО МО O R D S Ε С M R T A L S Ν L I N ΕV W Α 0 L 0 0 E S E S G Ν Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S T D R Ε Ε 1-03 Hangers and Supports X

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 16075 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: ELECTRICAL IDENTIFICATION TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S S T D R Ε Ε 2-01 Identification X

(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	esoto County, Mississippi																				161	23	
SECTIO	N TITLE:	BUIL	DING WIRE AND C	ABLE			٦	ΓΥΡΕ	OF SI	UBMI	TTAL				CLA FICA	SSI- TION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y N O O	TRANS- MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f	D R 4 ≷ − Z G Ø ₁	I N S T R U C T I O N S h	SCHEDULES.	STATEMENTS:	REPORTS	C E R T I F I C A T E S	S A M P L E S m.	E C O R D	A N U A L S	I N O L N Y	G O V E R N M E N T	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.		d. 1-03	Wire and Cable	т. Х	g.	n.	I.	J.	K.	l.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
		1	1-03	Test Results	Х										Х											
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(ER 415 1-10)

REGISTER CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 16131 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: CONDUIT TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М Т S C F 0 R V A TRANS-**SPECIFICATION** APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV W 0 Α 0 L 0 G S E S E S Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S T D R Ε Ε 1-04 Χ X Conduit

(ER 415 1-10)

		ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				161	38	
SECTION	I TITLE:	вох	ŒS				1	TYPE	OF S	UBM	ITTAL				CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A S - N G S s	N S T R U C T O N S h	8 C H E D D L E 8 -	S T A T E M E N T S :	R E P O R T の ,	C	8 A M P L E 8 E	R E C O R D S r.	O & M M A N U A L S o.	I N F O R M A T O I N O I N O I	G O V A E P R P N R O E V N E T D	R E V I E W E R .	SUBMIT	APPROVAL NEEDED BY	NEEDED BY	C O D E v.	DATE	SUBMIT TO GOVERN- MENT	C O D E y.	DATE	REMARKS
ä.	υ.	C.		Boxes	т. X	g.	H.	1.	J.	K.	I.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	y.	Z.	aa.
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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 16139 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: CABINETS AND ENCLOSURES TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М Т S C F 0 R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ΤО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S S T D R Ε Ε 1-04 Cabinets and Enclosures Χ

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				161	40	
SECTION	N TITLE:	WIR	ING DEVICES					TYPE	OF S	UBM	ITTAL				CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y N O	TRANS- MITTAL NO	I T E M N	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A & - N G S	- N % + R O C + - O Z %	8 C H E D J L E 8	S T A T E M E N T S	REPORTS	CERTIFICATES	SAMPLES	RECORDS	ANUALS	I N F O R M A T I O L Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
а.	b.	C.	d. 1-04	e. Wall Switches	f. X	g.	h.	I.	j.	k.	l.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	٧.	W.	X.	у.	Z.	aa.
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				Covers	X										X											
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(ER 415 1-10)

CONTRACT NO.

CONTRACTOR

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 16155 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: EQUIPMENT WIRING TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV W Α 0 L 0 0 G S E S E S Т Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S T D R Ε Ε **Equipment Wiring** Χ 1-01 X

TITLE AND LOCATION

SPECIFICATION SECTION:

(ER 415 1-10)

REGISTER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 16210 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: ELECTRICAL UTILITY SERVICES TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S s c М Т 0 F R V A A T TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н R E C М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α Μ V NUMBER NO MENT Ε W Т D Μ Р С Μ Ν NR O R D S U E N T 0 A T Р U ΤО МО М Ε С С R T A L S Ν L I N ΕV W 0 Α 0 L 0 Е E S G Ν Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Ε 1-04 X Service Racks Χ X 1-04 Primary Underground Raceway ХХ X ХХ Transformer Pad 1-04 Χ

TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	esoto County, Mississippi																				162	31	
SECTIO	N TITLE:	PAC	KAGED ENGINE G	ENERATORS				TYPE	OF S	SUBM	ITTAL					ASSI- ATION			CONTRACT			CONTRA ACTI	ACTOR ON	GOVERNMEN		
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A & - N G % c	- N S T R U C T - O Z S h	0 C H E D D L E 0 -	S T A T E M E N T S :	ス E P O R 干 の ょ	C	SAMPLESE.	RECORDS n.	0 & M M A N U A L % o.	I N F O R M A T O I N O L N Y	G O V A P P R P N R O E V N E D T C	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY U.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
a.	D.	C.		Engine Generator	X	X	X	1.	j·	X	- 1.	111.	11.	X	ρ.	X	1.	3.	ι.	u.	V.	w.	Α.	у.	Σ.	aa.
			1-04	Test Results	Х										Х						l					
				Manuf. Qualifications	X										X						1					
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(ER 415 1-10)

CONTRACT NO.

SECTION A	TIT! 5		Facility, D	Desoto County, Mississippi																					
	TITLE															L							162	72_	
А	I IIILE:	DRY	TYPE TRANSFOR	MERS			1	YPE	OF SU	IBMIT	TAL			CL. FIC	ASSI- ATION			CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
C T I V I T Y	TRANS- MITTAL NO	I T E M N	SPECIFICATION PARAGRAPH NUMBER	SUBMITTED	D A T A f.	DRAW-NGS	I N S T R U C T I O N S	SCHEDULES	E M E N T	R E P O R T	I	A M P L E S	O & M E A A C O O R A L S S	N F O R M A T O I N O L N Y	E V N E T D	R E V I E W E R	SUBMIT	BY	MATERIAL NEEDED BY	СОДЕ	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	d. 1-04	Dry Type Transformer	f. X	g.	h.	I.	j.	k.	l. r	n.	n. o.	р. Х	q.	r.	S.	t.	u.	٧.	W.	X.	y.	Z.	aa.
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(ER 415 1-10)

EGISTER CONTRACT NO.

CONTRACTOR

SECTION TITLE: ENCLOSED CIRCUIT BREAKERS	REMARKS
A C C T T TRANS- I TRANS- I TRANS- I NO E NOTE TITE OF SUBMITTED NO E NO E NO E NOTE TITE OF SUBMITTED NO E NO E NO E NO E NO E NO E NO E NO	REMARKS
A C C T T TRANS- V MITTAL T E NO E NO E SUBMITTED DESCRIPTION OF ITEM SUBMITTED DESCRIPTIO	REMARKS
a. b. c. d. e. f. g. h. l. j. k. l. m. n. o. p. q. r. s. t. u. v. w. x. y. z.	aa.
1-04 Circuit Breakers X X X	

TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

CONTRACT NO.

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				164	12	
SECTIO	N TITLE:	ENC	CLOSED SWITCHES	6				TYPE	OF S	UBMI	TTAL				CLA FICA	ASSI- ATION		Ş	CONTRACT SCHEDULE D	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	IT ACTION	
A C T I V I T Y	TRANS- MITTAL NO	I T E M N O	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	DRAW-NGS	- N S T R U C T - O Z S	осн по от по.	S T A T E M E N T S	R E P O R T S	C E R T I F I C A T E S	SAMPLES	RECORDS	A N U A L S	I N F O R M A T I O L Y	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE	SUBMIT TO GOVERN- MENT	C O D E	DATE	REMARKS
a.	b.	C.	1-04	Nonfusible Swithches	f. X	g.	h.	l.	j.	k.	l.	m.	n.	0.	р. Х	q.	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
			1	Fusible Swithches	Х										Х											
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(ER 415 1-10)

TITLE A	ND LOCATI	ON		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				164	13	
SECTIO	N TITLE:	AUT	OMATIC TRANSFE	R SWITCH				TYPE	OF S	SUBM	ITTAL	-				ASSI- ATION			CONTRACT			CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A & - N G % c	- Z O - + O C Z + O Z O F	ост ш о о п ш о -	S T A T E M E N T S :-	と 田 P 〇 R T の ェ	C	8 A M P L E 8 E	R E C O R D S ri	O & M M A N U A L S o.	I N F O R M A T O I N O I N O I	G O V A E P R P N R M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
a.	D.	C.	1-04	Transfer Switch	X	X	11.	1.	J·	N.	X	111.	11.	X	ρ.	X	- 1.	5.	ι.	u.	V.	W.		у.	Ζ.	aa.
			1-04	Test Reports	Х										Х											
				Wiring Diagrams		Χ										Х										
			1-05	Manuf. Qualifications	Х										Х											
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(ER 415 1-10)

	TITLE:	ENCI	Facility, D	esoto County, Mississippi																					
A C T	TITLE:	ENCI																					164	23	
C T I			LOSED MOTOR CO	ONTROLLERS			Т	YPE (OF SU	ВМІТ	TAL				LASSI- CATION		,	CONTRACT			CONTRA		GOVERNMEN		
۱ ۷	TRANS- MITTAL	I T	SPECIFICATION PARAGRAPH	DESCRIPTION OF ITEM SUBMITTED		D R A	I N S T R U C	S C H E		R	C E R T I	S A	R ME) I N M F O M R	G O V A E P R P	R E V	SUBMIT	APPROVAL NEEDED	MATERIAL NEEDED		DATE	SUBMIT TO GOVERN-		DATE	REMARKS
T Y N O a.	NO b.	E M Z O σ	NUMBER d.	е.	D A T A f.	: S — Z G の sj	T I O N S h.	D U L	M E N T	P O R T	C I A I E I S S	P L E S	E A C N O L R A D L S S n. c	A T I O N	N R O M O N E V L N E	I E W E	S.	BY t.	BY u.	C O D E v.	w.	MENT x.	C O D E y.	z.	aa.
			1-04	Manual Motor																					
				Controllers	X									Х											
			1-04	Magnetic Motor																					
				Contollers	Х									Х											
			1-04	Combination Magnetic																					
				Motor Controllers	X									Х											
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(ER 415 1-10)

TITLE A	ND LOCATI	ION		k Wastewater Treatment													CONT	RACTOR						SPECIFICATION	SECTION:	
			Facility, D	Desoto County, Mississippi																				164	26	
SECTIO	N TITLE:	ENC	CLOSED CONTACT	ORS				TYPE	OF S	UBM	ITTAL	-			CLA FICA	ASSI- ATION		5	CONTRACT	OR ATES		CONTRA ACTI	CTOR ON	GOVERNMEN	NT ACTION	
A C T I V I T Y	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T A f.	D R A & - N G % a	- N S T R U C T - O Z S h	8 C H E D D L E 8 -	S T A T E M E N T S :-	к п р О к н ю к	C	SAMPLESE.	R E C O R D S r.	O & M M A N U A L S o.	I N F O R M A T O I N O L N Y	G O V A P P R P N M O E V N E T D	R E V I E W E R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY u.	C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
u.	D.	Ü.	1-04	General Purpose	X	g.			,	10.				<u> </u>	X	ч.		J.		u.	,.	**.	Λ.	J.	2.	uu.
				Contactors																						
		l	1-04	Lighting Contactors	Х										Х											
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(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

			Facility, Desoto County, Mississippi ELBOARDS TYPE OF SUBMITTAL																					164	43	
SECTION	TITLE:	PANI	ELBOARDS				-	TYPE	OF S	UBM	ITTAL	-			CLA FICA	ASSI- ATION			CONTRACT			CONTRA	ACTOR ON	GOVERNMEN		
A C T I V I T Y N	TRANS- MITTAL NO	I Т Е М	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	D A T	DRAW-NG	- N S T R U C T - O Z	8 C H E D U L I	S T A T E M E N T	R E P O R T	CERTIFICATE	SAMPL	R E C O R D	M M A N U A	I N F O R M A T O N O L	G O > E R R O >	R E V E W E	SUBMIT	APPROVAL		C O D	DATE	SUBMIT TO GOVERN- MENT	C O D	DATE	REMARKS
0		0			Α	G S	N S	E S	S	S	E S	E S m.			NY	N E T D	R				Е			E		
a.	b.	C.	d. 1-04	Panelboards	f.	g. X	h.	l.	J.	k.	l.	m.	n.	0.	p.	q. X	r.	S.	t.	u.	V.	W.	X.	у.	Z.	aa.
					 																					
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CONTRACTOR

TITLE AND LOCATION

Short Fork Wastewater Treatment

(ER 415 1-10)

GISTER CONTRACT NO.

CONTRACTOR

Facility, Desoto County, Mississippi 16480 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: POWER CONTROL CENTER TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С М 0 Т S F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO BY MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ТО МО Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S G Ν Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S S NY T D R Ε Ε X 1-04 Power Control Center 1-05 Manuf. Qualifications Χ Χ 1-07 Warranty X

TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION CONTRACTOR SPECIFICATION SECTION: Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 16481 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: MOTOR CONTROL CENTER TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E ΕP R F S М Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N T 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S G Ν Ε O L ΝE Ε D D Ν Ν S 0 0 S S S S NY T D R Ε Ε $\mathbf{x} \mid \mathbf{x}$ Motor Control Center 1-02 Χ Load Current and 1-02 1-02 Overload Heater List X X Field Test Reports 1-02

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Short Fork Wastewater Treatment Facility, Desoto County, Mississippi 16482 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: VARIABLE FREQUENCY DRIVES TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION C E R N S O & Α G С S М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО М O R D S Ε С С R T A L S Ν L I N ΕV Α 0 L W 0 0 Е E S G Ν Т Ε O L ΝE Ε D D Ν Ν S NY 0 0 S S S S S T D R Ε Ε 1-02 Variable Freguency Drives $\mathbf{x} \mathbf{x}$ Χ 1-02 Test Results X Manuf. Qualifications 1-03 Χ

CONTRACTOR

TITLE AND LOCATION

(ER 415 1-10)

EGISTER CONTRACT NO.

CONTRACTOR

	Facility, Desoto County, Mississippi N TITLE: FUSES TYPE OF SUBMITTAL																					1649	91			
SECTIO	N TITLE:	FUS	ES					TYPE	OF S	SUBM	ITTAL				CL/ FIC/	ASSI- ATION		,	CONTRACT	OR ATES		CONTRA	CTOR ON	GOVERNMEN		
A C T I V I T Y N O a.	TRANS-MITTAL NO	I T E M N O c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	D A T A f.	DRAWINGS g.	I N S T R U C T I O N S h.	осн п о о т п о т	STATEMENTS	R E P O R T S k	C	Е	RECORDS n.	O & M M A R D A L S o	I N F O R M A T I O L Y	E V N E	R E V I E W E R r.	SUBMITI	APPROVAL		C O D E v.	DATE w.	SUBMIT TO GOVERN- MENT	C O D E y.	DATE z.	REMARKS aa.
			1-03	Fuses	Х										X											
			1-03	Spare Fuse Cabinet	Х										X											_
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TITLE AND LOCATION

Short Fork Wastewater Treatment

SPECIFICATION SECTION:

(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION Short Fork Wastewater Treatment CONTRACTOR SPECIFICATION SECTION: Facility, Desoto County, Mississippi 16510 CONTRACTOR SCHEDULE DATES CLASSI-CONTRACTOR GOVERNMENT ACTION SECTION TITLE: LIGHTING FIXTURES TYPE OF SUBMITTAL FICATION ACTION C E R N S O & Α G С Ν М 0 Т S C F R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α V NUMBER NO MENT Ε W Т D Μ Р С Μ С Ν NR O R D S U E N 0 A T Р U ΤО МО Ε С M R T A L S Ν L I N ΕV 0 Α 0 L W 0 G S E S E S Т Ν Т Ε O L ΝE Ε D D Ν Ν NY 0 0 S S S S T D R Ε Ε 1-03 Lighting Fixtures X

(ER 415 1-10)

CONTRACT NO.

SPECIFICATION SECTION:

Facility, Desoto County, Mississippi 16821 CLASSI-CONTRACTOR CONTRACTOR GOVERNMENT ACTION SECTION TITLE: MISCELLANEOUS RACEWAY SYSTEMS TYPE OF SUBMITTAL FICATION SCHEDULE DATES ACTION E R N S O & Α G С S Ν М Т S F 0 С R V A TRANS-SPECIFICATION APPROVAL MATERIAL SUBMIT TO DESCRIPTION OF ITEM R U Н Т R E М ΕP R F S Ε MITTAL PARAGRAPH SUBMIT NEEDED NEEDED DATE GOVERN-DATE REMARKS SUBMITTED Е Е RΡ Α С Ε Α Α Μ V NO NUMBER BY MENT Ε W Т D Μ Р С Μ С Ν NR U E N 0 A T Р U ТО МО O R D S Ε С M R T A L S Ν L I N ΕV Α 0 L W 0 0 E S E S Т G Ν Т Ε O L ΝE Ε D D Ν Ν 0 0 S S S S S NY T D R Ε Ε 1-04 Raceway System Telephones Χ 1-04 Raceway System SCADA Χ X

CONTRACTOR

TITLE AND LOCATION

Short Fork Wastewater Treatment

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01355A

ENVIRONMENTAL PROTECTION

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DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01355A

ENVIRONMENTAL PROTECTION

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SECTION 01355A

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCE

The publications listed below form a part of this specification to the Basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 152 - 186	Pesticide Programs
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
49 CFR 171 - 178	Hazardous Materials Regulations
U.S. ARMY CORPS OF E	NGINEERS (USACE)
EM 385-1-1	(1996) U.S. Army Corps on Engineers Safety and Health Requirements Manual

1.2 **DEFINITIONS**

WETLAND MANUAL

1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade

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Technical Report Y-87-1

the environment aesthetically, culturally and/or historically.

1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.3 Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

1.2.4 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

1.2.5 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

1.2.6 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.2.7 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground-water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with WETLAND MANUAL or as indicated on the plans.

1.3 GENERAL REQUIREMENTS

The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

1.4 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

1.5 PAYMENT

No separate payment will be made for work covered under this section. The Contractor shall be responsible for payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor.

All costs associated with this section shall be included in the lump sum contract price. The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G, [Construction]

The environmental protection plan

1.7 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, the Contractor shall submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues that the Contractor must address during construction. Issues of concern shall be defined within the Environmental Protection Plan as outlined in this section. The Contractor will address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues that are not identified in this section, but which the Contractor considers necessary, shall be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, the Contractor shall meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.

1.7.1 Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.7.2 Contents

The environmental protection plan shall include, but shall not be limited to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection person
- d. Description of the Contractor's environmental protection personnel training program.
- e. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.
- f. Drawings showing locations of proposed temporary excavations or embankments

for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.

- g. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.
- h. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- i. Drawing showing the location of borrow areas
- j. The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:
 - 1. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.
 - 2. The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.
 - 3. Training requirements for Contractor's personnel and methods of accomplishing the training.
 - 4. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
 - 5. The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.
 - 6. The methods and procedures to be used for expeditious contaminant cleanup.
- k. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted

for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic meters yards of tons along with the percent that was diverted.

- 1. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources: The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.
- m. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.
- n. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time shall be included in the contaminant prevention plan. As new hazardous materials are brought on site or removed from the site, the plan shall be updated.
- o. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan shall include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the wastewater, the plan shall include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, a copy of the permit and associated documents shall be included as an attachment prior to discharging the wastewater. If disposal is to a sanitary sewer, the plan shall include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.
- p. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. The plan shall

include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Contracting Officer.

1.7.3 Appendix

Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents shall be attached, as an appendix, to the Environmental Protection Plan.

1.8 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. Both the Contractor and the Contracting Officer, upon mutual agreement as to its accuracy and completeness shall sign this survey report. The Contractor shall protect those environmental features included in the survey report and any indicated on the drawings regardless of interference that their preservation may cause to the Contractor's work under the contract.

1.9 SPECIAL ENVIRONMENTAL REQUIREMENTS

The Contractor shall comply with the special environmental requirements listed here [N/A] and included at the end of this section.

1.10 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations requested by the Contractor from the drawings, plans, and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.11 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such

suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTIONS

3.1 ENVIRONMENTAL PERMITS AND COMMITMENTS

The Contractor shall be responsible for obtaining and complying with all environmental permits and commitments required by Federal, State, Regional, and local environmental laws and regulations.

3.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. The Contractor shall remove Stone, soil, or other materials displaced into uncleared areas.

3.2.1 Work Area Limits

Prior to commencing construction activities, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area that are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.2.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs) as indicated on the drawings as specified in Section 01356 STORM WATER POLLUTION PREVENTION MEASURES. BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation.

3.2.4 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering embankments for plant and/or work areas shall be controlled to protect adjacent areas.

3.3 WATER RESOURCES

The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

3.3.1 Cofferdams, Diversions, and Dewatering Operations

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to maintain compliance with existing State water quality standards and designated uses of the surface water body.

The Contractor shall comply with the State of Mississippi water quality standards and anti-degradation provisions.

3.3.2 Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments.

3.3.3 Wetlands

The Contractor shall not enter, disturb, destroy, or allow discharge of contaminants into any wetlands except as authorized herein. The Contractor shall be responsible for the protection of wetlands shown on the drawings in accordance with paragraph ENVIRONMENTAL PERMITS, REVIEWS, AND APPROVALS. Authorization to enter specific wetlands identified shall not relieve the Contractor from any obligation to protect other wetlands within, adjacent to, or in the vicinity of the construction site and associated boundaries.

3.4 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.

3.4.1 Particulates

Dust particles, aerosols and gaseous by-products from construction Activities, and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs. The Contractor shall comply with all State and local visibility regulations.

3.4.2 Odors

Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances

3.4.3 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise. The Contractor shall comply with the provisions of the State of Mississippi rules.

3.4.4 Burning

The Contracting Officer will not allow burning on the project site unless specified in other sections of the specifications or authorized in writing. The specific time, location, and manner of burning shall be subject to approval.

3.5 Not Used

3.6 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.6.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers that are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal option. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. The Contractor shall comply with Federal, State, and local laws and regulations] pertaining to the use of landfill areas.

3.6.2 Chemicals and Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. The Government will periodically review this documentation. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 150 mm 6 inches of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

3.6.3 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. Storage of fuel on the project site shall be accordance with all Federal, State, and local laws and regulations.

3.6.4 Waste Water

Disposal of wastewater shall be as specified below:

- a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related wastewater off-Government property in accordance with all Federal, State, Regional and Local laws and regulations.
- b. For discharge of ground water, the Contractor shall obtain a State or Federal permit specific for pumping and discharging ground water prior to surface discharging.
- c. Water generated from the flushing of lines after disinfection, or disinfection in conjunction with hydrostatic testing

3.7 RECYCLING AND WASTE MINIMIZATION

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

3.8 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris.

The Contractor shall submit a report to the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that non-hazardous solid waste has been generated. The following will be included in the report:

a.	Construction and Demolition (C&D) Debris Disposed = [] in
	cubic meters, cubic yards or tons, as appropriate.	

b. Construction and Demolition (C&D) Debris Recycled = [____] in cubic meters, cubic yards or tons, as appropriate.

c.	Total C&D appropriate.	Debris	Generated	= [_] in	cubic	meters,	cubic	yards	or	tons,	as
d.	Waste Sent to should not be tons, as appre	e include				`		ıbic me	eters, c	ubic	yards	or

3.9 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.10 BIOLOGICAL RESOURCES

The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.11 NOT USED

3.12 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

3.13 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

DACW66-03-B-0003

3.14 NOT USED

3.15 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.16 NOT USED

3.17 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". The Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area shall be graded, filled and the entire area seeded unless otherwise indicated.

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01356

STORM WATER POLLUTION PREVENTION MEASURES

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SECTION 01356

STORM WATER POLLUTION PREVENTION MEASURES

PART 1 -GENERAL

1-01 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4439 (1997)	Standard Terminology for Geosynthetics				
ASTM D 4491 (1996)	Water Permeability of Geotextiles by Permittivity				
ASTM D 4533 (1991; R 1996)	Trapezoid Tearing Strength of Geotextiles				
ASTM D 4632 (1991; R 1996)	Grab Breaking Load and Elongation of Geotextiles				
ASTM D 4751 (1995)	Determining Apparent Opening Size of a				
Geotextile					
ASTM D 4873 (1995)	Identification, Storage, and Handling of				
	Geosynthetic Rolls				

1-02 GENERAL

A. The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01354 ENVIRONMENTAL PROTECTION, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit attached to that Section.

1-03. SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificate:

Mill Certificate or Affidavit - Certificate attesting that the Contractor has met all specified requirements set forth in the SWPPP for the project and all BMP's as required by MDEQ and as outlined in the plans and other areas in the specifications.

1-04 EROSION AND SEDIMENT CONTROLS

The controls and measures required are described below.

A. Stabilization Practices

The stabilization practices to be implemented shall include seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control matts, protection of trees, preservation of mature vegetation, etc. On his daily CQC Report, the

Contractor shall record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, embankment, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

1. Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

- 2. No Activity for Less Than 21 Days. Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.
- 3. Once all construction activity is ceased in an area permanentely, all disturbed areas shall be seeded, mulched and protected from erosion. The contractor shall be responsible for re-seeding and mulching at no additional cost to the Government if seeds are eroded away by rain.

B. Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices. Location and details of installation and construction are shown on the drawings.

- 1. Silt Fences: The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Silt fences shall be installed in the locations indicated on the drawings. Additional silt fences may be required due to construction phasing. Final removal of silt fence barriers shall be upon approval by the Contracting Officer.
- 2. Straw Bales: The Contractor shall provide bales of straw as a temporary structural practice to minimize erosion and sediment runoff. Bales shall be properly placed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and grubbing in a

area between a ridge and drain, bales shall be placed as work progresses, bales shall be removed/replaced/relocated as needed for work to progress in the drainage area). Areas where straw bales are to be used are shown on the drawings. Additional straw bales may be required due to construction phasing. Final removal of straw bale barriers shall be upon approval by the Contracting Officer.

Rows of bales of straw shall be provided as follows:

- a. At the entrance to culverts that receive runoff from disturbed areas.
- b. Perpendicular to the flow at the bottom of fill slopes at culvert outlets.
- 3. Temporary Berms: A temporary berm shall be constructed of compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches with or without a shallow ditch, constructed at the top of fill slopes or transverse to centerline on fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with only minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately at 10 degree angle with a perpendicular to centerline. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical and until final roadway elevations are approached, embankments should be should be constructed with a gradual slope to 1 side of the embankment to permit the placement of temporary berms and slope drains on only 1 side of the embankment.
- 4. Sediment Structures: Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.

When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and property compacted. The existing ground shall be restored to its natural or intended condition.

PART 2 - PRODUCTS

2-01 COMPONENTS FOR SILT FENCES

A. Filter Fabric The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make

the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE PHYSICAL PROPERTY TEST PROCEDURE STRENGTH REQUIREMENT (Metric)

Grab Tensile ASTM D 4632 445 N min.
Elongation (%) 30 % max.
Trapezoid Tear ASTM D 4533 245 N min.
Permittivity ASTM D 4491 0.2 sec-1
AOS (U.S. Std Sieve) ASTM D 4751 20-100

FILTER FABRIC FOR SILT SCREEN FENCE PHYSICAL PROPERTY TEST PROCEDURE STRENGTH REQUIREMENT (English)

Grab Tensile ASTM D 4632

Elongation (%)

Trapezoid Tear ASTM D 4533

Permittivity ASTM D 4491

AOS (U.S. Std Sieve) ASTM D 4751

100 lbs. min.
30 % max.
55 lbs. min.
0.2 sec-1
20-100

- B. Silt Fence Stakes and Posts: The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.
- C. Mill Certificate or Affidavit: A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.
- D. Identification Storage and Handling: Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

2-02 COMPONENTS FOR STRAW BALES

A. The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. The bales shall have a standard cross section of 14 inches by 18 inches. All bales shall be either wirebound or string-tied. The Contractor may use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have minimum dimensions of 2 inches x 2 inches in cross section and shall have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 3 feet.

PART 3 - EXECUTION

3-01 INSTALLATION OF SILT FENCES

A. Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The by 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Contracting Officer.

3-02 INSTALLATION OF STRAW BALES

A. Straw bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier. Loose straw shall be scattered over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

3-03 MAINTENANCE

- A. The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.
 - 1. Silt Fence Maintenance: Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall

be seeded in accordance with Section 02480.

2. Straw Bale Maintenance: Straw bale barriers shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to barriers or replacement of bales shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Bale rows used to retain sediment shall be turned uphill at each end of each row. When a straw bale barrier is no longer required, it shall be removed. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section 02480.

3-04 INSPECTIONS

- A. General: The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.
- B. Inspections Details: Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.
- C. Inspection Reports: For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.
- D. Monthly Inspection Report and Certification Form for Erosion and Sediment Controls

On the first working day of each month the Contractor shall complete, sign, and submit the original form to the State of Mississippi, Office of Pollution Control (OPC) at the following address:

Chief, Environmental Permits Division Mississippi Department of Environmental Quality, Office of Pollution Control P.O. Box 10385 Jackson, Mississippi, 39289-0385 A copy of the State of Mississippi's Monthly Inspection Report and Certification Form for Erosion and Sediment Controls is attached to the end of this section. On the first working day of each month the Contractor shall also furnish one copy of the form submitted to the OPC to the Contracting Officer as part of the Contractor's daily CQC Report and attach a copy of the completed form to the Plan. Unless otherwise notified by the OPC, the Contractor shall submit the Monthly Inspection Report and Certification Forms for an additional two months after the final completion of all storm water pollution prevention measures required in this contract have been implemented.

Part VII.

MONTHLY INSPECTION REPORT AND CERTIFICATION FORM FOR EROSION AND SEDIMENT CONTROLS

Inspections must be done weekly and after a Two-Year, 24-Hour Rainfall (4 inches at the Tenn. Border to 6 inches on the Gulf Coast)

Construction Storm W	ater General NPDES Per (Fill in your Certificate of C	rmit No. MSR10 overage Number & (Please Print)	County:)
Owner and/or Prime Contractor:				
Project Name:				
Street Address:				
City:				
Startup Date:		'		_
		Inspection Log		
Date and Time	After a 2-Year, 24-Hour Ruin?	Rain Gauge Measurement (inches)	Any Deficiencies Observed?	Inspector(s)
	Yes or No		Yes or No	
	Yes or No		Yes or No	
	Yes or No		Yes or No	
	Yes or No		Yes or No	
	Yes or No		Yes or No	
Deficiencies Noted During any Insp	vection (give date(s); attach addition	oil shorts if necessary):		
Corrective Action Taken or Planned	(give date(s)); (attach additional sh	sects if necessary):		
implemented and maintained, except Office of Pollution Control and sour certify under penalty of law that the tesigned to assure that qualified per- responsible for gathering the inform	t for those deficiencies noted above ad engineering practices as required is document and all attachments we some! properly gather and evaluate ation, the information submitted is,	e, in accordance with the by the above reference are prepared under my de the information submit to the best of my know	ify that all erosion and sediment controls e Storm Water Pollution Prevention Plan of permit. firection or supervision in accordance wi med. Based on my inquiry of the person rledge and belief, true, accurate and come fines and imprisonment for knowing vio	filed with the
Authorized Name (Print)	Signatu	re	Date	
These reports shall be submitted as a	required in the permit, to:		onmental Permits Division sent of Environmental Quality, Office of 385	Pollution Control

Jackson, Mississippi 39289-0385

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01451A

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 PAYMENT

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

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- 3.2 QUALITY CONTROL PLAN
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 - 3.2.2 Content of the CQC Plan
 - 3.2.3 Acceptance of Plan
 - 3.2.4 Notification of Changes
- 3.3 COORDINATION MEETING
- 3.4 QUALITY CONTROL ORGANIZATION
 - 3.4.1 CQC System Manager
 - 3.4.2 CQC Staff
 - 3.4.3 Additional Requirement
- 3.5 SUBMITTALS
- 3.6 CONTROL
 - 3.6.1 Preparatory Phase
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- 3.7 TESTS
 - 3.7.1 Testing Procedure
 - 3.7.2 Testing Laboratories
 - 3.7.2.1 Capability Check
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 - 3.7.4 Furnishing of Transportation of Samples for Testing
- 3.8 COMPLETION INSPECTION
- 3.9 DOCUMENTATION
- 3.10 NOTIFICATION OF NONCOMPLIANCE

SECTION 01451A

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1994a) Minimum Requirements for Agencies Engaged in the
	Testing and/or Inspection of Soil and Rock as Used in
	Engineering Design and Construction
ASTM E 329	(1993b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both on-site and off-site, and shall be keyed to the proposed construction sequence.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 21 calendar days after receipt of Notice of Award of the contract, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause entitled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 15

days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC plan shall include, as a minimum, the following to cover all construction operations, both on-site and off-site, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC system manager who shall report to the project manager or someone higher in the Contractor's organization. Project manager in this context shall mean the individual with responsibility for the overall management of the project including quality and production.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with SECTION 01300 SUBMITTALS.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the QC plan, the Contractor shall notify the Contracting Officer in writing a minimum of seven calendar days prior to any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the Quality Control Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 CQC System Manager

The Contractor shall identify an individual within his organization at the worksite who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be subject to acceptance by the Contracting Officer. The full time CQC System Manager's sole responsibility is to insure compliance with contract plans and specifications.

3.4.2 CQC Staff

A staff shall be maintained under the direction of the CQC System Manager to perform all CQC activities. An alternate will be identified to serve in the absence of the CQC System Manager. The staff must be of sufficient size to ensure adequate CQC coverage of all work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned CQC responsibilities and must be allowed sufficient time to carry out these responsibilities. The CQC plan will clearly state the duties and responsibilities of each staff member. All CQC Staff members or replacements shall be subject to acceptance by the Contracting Officer.

3.4.3 Additional Requirement

In addition to the above requirements, the CQC System Manager, and his alternate, and also includes individuals appointed as alternates, shall complete the course entitled "Construction Quality Management for Contractors" This course is periodically offered by the Memphis District as well as other Corps Districts.

3.5 SUBMITTALS

Submittals shall be in accordance with SECTION 01330 – SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

The controls shall include at least three phases of control to be conducted by the CQC System Manager for all definable features of work, as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. A check to assure that provisions have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for constructing the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that phase of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. The Government shall be notified at least 24 hours in advance of beginning any of the required action of the preparatory phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of preliminary work to ensure that it is in compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verification of full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with sample panels is appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work on-site, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-Up Phase

Daily checks shall be performed to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

As determined by the Government, additional preparatory and initial phases may be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, on-site production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, will be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility will be provided directly to the Contracting Officer. Failure to submit timely test

reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

Burns Cooley Dennis, Inc.

551 Sunnybrook Road Ridgeland, MS 39157 (601) 856-9911

Expiration Date: March 1, 2003

Hall, Blake and Associates, Inc.

2400 Highway 51 South, Suite 2 Hernando, Ms 38632 (662) 249-1216

Jordan, Kaiser & Sessions, LLC

279 Lower Woodville Road
P. O. Box 1267
Natchez, Mississippi 39120
(601) 442-3628
Expiration Data Luky 18, 2005

Expiration Date: July 18, 2005

3.7.2.1 Capability Check

The Contracting Officer reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor. There will be no extension of time allowed due to necessity to perform capability rechecks.

3.7.3 On-Site Laboratory

The Contracting Officer reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered by the Contractor to a location specified by the Contracting Officer.

3.8 COMPLETION INSPECTION

At the completion of all work or any increment thereof established by a completion time stated in the SPECIAL CONTRACT REQUIREMENTS entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Government. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals reviewed, with contract reference, by whom, and actions taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, instructions or corrective actions.

- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the worksite, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01452

PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL SIGNS

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01452

PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL SIGNS

PART - 1 GENERAL

1-01 SCOPE

The work covered by this section consists of furnishing, erecting, maintaining, and removing project signs, barricades, and traffic control signs.

1-02 PROJECT SIGNS

The Contractor shall furnish, erect, and maintain one double-faced project sign, at the specific location designated by the Contracting Officer. The sign shall be constructed of 3/4-inch A-C exterior plywood or 22 gage metal, mounted on a substantial framework of 2-inch material. Size, lettering, color and paint shall conform to the details shown on the drawing "Temporary Project Sign" included at the end of this section. Upon request, the Government will furnish without cost to the Contractor two decals of the Engineer Castle. The sign shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The sign shall be removed upon completion of all other construction work under the contract and will become the property of the Contractor.

1-03 BARRICADES AND TRAFFIC CONTROL SIGNS

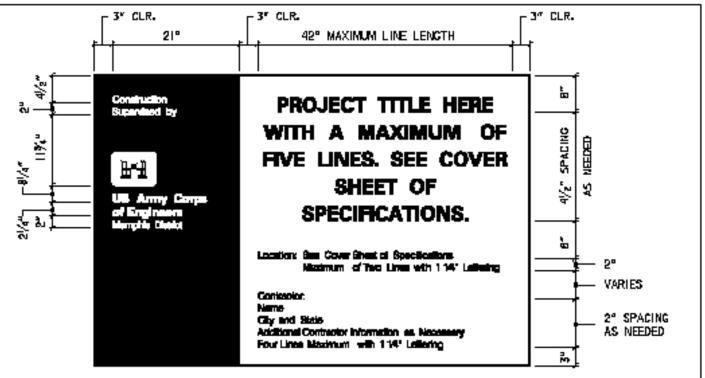
Barricades and traffic control signs shall be those as recommended by the Contracting Officer and conform to the "Manual on Uniform Traffic Control Devices for Streets and Highways," Current Edition.

1-04 PAYMENT

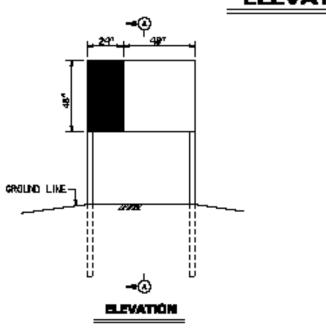
No separate payment will be made for erecting, maintaining and removing project signs, barricades, and traffic control signs and all costs in connection therewith will be considered an incidental obligation of the Contractor.

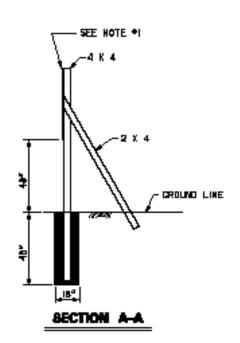
PART - 2 PRODUCTS (Not Applicable)

PART - 3 EXECUTION (Not Applicable)



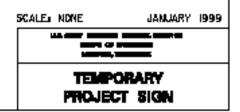
ELEVATION





SPECIFICATIONS

- L SIGN PANEL SHALL BE 4" K 8" K K" EXTERBOR GRADE PLYNOOD OR BE GAGE SHEET NETAL.
- 2. POSTS AND BRACIND SHALL BE TREATED, NO. 1 GRADE YELLOW PINE.
- 3. ALL EXPOSED SURFACES SHALL BE GIVEN DHE COAT OF LINSEED DIL AND RIPED PRIDA TO PRIMING.
- ALL EXPOSED SURFACES, SHALL BE GIVEN DIRE COAT OF MITTE AS PRIMER, SECOND COAT SHALL BE CONNUNICATIONS RED ON LEFT AND MITTE BLISSMERS.
- 5. THE LEFT SECTION SHALL BE RED WITH WHITE LEGEND. THE RICHT SECTION SHALL BE WHITE WITH BLACK LEGEND.
- 6. PAINT SHALL BE BENJUMIN WOORE NO. 120-60 POLY-SILICONE ENAMEL OR APPROVED EQUAL.
- 7. ALL LETTERING SHALL BE MY WITH A TWO INCH LETTER SPACING UNLESS MOTED OTHERWISE. THE WORDS "US Army Corps of Engineers" SHALL BE MY TALL. THE PROJECT TITLE LETTERING SHALL BE A MINIMUM OF MY TALL AND A MAXIMUM OF MY TALL. THE LETTERING SIZE SHALL BE CHOSEN SHOWN THAT LARGEST POSSIBLE LETTERS ARE USED MITHAUT EXCEEDING A MAXIMUM LINE LEWITH OF 42". THE MUMBER OF LINES IN THE PROJECT TITLE SHALL MATCH THAT SHOWN ON THE COURS SHEET OF THE SPECIFICATIONS.



DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01781

OPERATION AND MAINTENANCE DATA

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1.3.1	

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01781

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01330, "Submittal Procedures."

- 1.1.1 Package Quality: Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.
- 1.1.2 Package Content: Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission.
- 1.1.3 Changes to Submittals: Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

1.2 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

- 1.2.1 Operating Instructions: Include specific instructions, procedures, and illustrations for the following phases of operation:
- 1.2.1.1 Safety Precautions: List personnel hazards and equipment or product safety precautions for all operating conditions.
- 1.2.1.2 Operator Prestart: Include procedures required to set up and prepare each system for use.
- 1.2.1.3 Startup, Shutdown, and Post-Shutdown Procedures: Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

- 1.2.1.4 Normal Operations: Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.
- 1.2.1.5 Emergency Operations: Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.
- 1.2.1.6 Operator Service Requirements: Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.
- 1.2.1.7 Environmental Conditions: Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.
- 1.2.2 Preventive Maintenance: Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair.
- 1.2.2.1 Lubrication Data: Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":
 - a. A table showing recommended lubricants for specific temperature ranges and applications.
 - b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
 - c. A Lubrication Schedule showing service interval frequency.
- 1.2.2.2 Preventive Maintenance Plan and Schedule: Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.
- 1.2.3 Corrective Maintenance (Repair): Include manufacturer's recommended procedures and instructions for correcting problems and making repairs.
- 1.2.3.1 Troubleshooting Guides and Diagnostic Techniques: Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.
- 1.2.3.2 Wiring Diagrams and Control Diagrams: Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces.

Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

- 1.2.3.3 Maintenance and Repair Procedures: Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.
- 1.2.3.4 Removal and Replacement Instructions: Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.
- 1.2.3.5 Spare Parts and Supply Lists: Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.
- 1.2.4 Corrective Maintenance Work-Hours: Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.
- 1.2.5 Appendices: Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:
- 1.2.6 Parts Identification: Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog.
- 1.2.6.1 Warranty Information: List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.
- 1.2.6.2 Personnel Training Requirements: Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

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- 1.2.6.3 Testing Equipment and Special Tool Information: Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.
- 1.2.6.4 Contractor Information: Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.3 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data package specified below for individual technical sections. The required information for each O&M data package is as follows:

1.3.1 Data Package

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Operator service requirements
- g. Environmental conditions
- h. Lubrication data
- i. Preventive maintenance plan and schedule
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- 1. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Corrective maintenance man-hours
- p. Parts identification
- q. Warranty information
- r. Personnel training requirements
- s. Testing equipment and special tool information
- t. Contractor information

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

DIVISION 2 - SITEWORK

SECTION 02020

EROSION CONTROL

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1-03	SUBMITTALS
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2-02	TEMPORARY SLOPE DRAINS
2-03	SEDIMENT STRUCTURES
2-04	TEMPORARY SEEDING AND MULCHING
2-05	BALED HAY OR STRAW CHECKS
2-06	TEMPORARY SILT FENCES
PART 3	– EXECUTION
3-01	EROSION CONTROL PLAN
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3-04	MAINTENANCE
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SECTION 02020

EROSION CONTROL

PART 1 - GENERAL

1-01 REQUIREMENTS

A. Applicable provisions of the General Conditions and of Division 1 - General Requirements govern all work specified in this Section.

1-02 DESCRIPTION

- A. This work shall consist of erosion control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, the pumping of water, and any other means appropriate to restrain flooding of plant and equipment. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control. In case of abnormally cold weather, any construction such as excavation work may be delayed in weather or covered to prevent freezing.
- B. The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to ensure economical, effective, and continuous erosion control throughout the construction and post-construction period.
- C. Since the Contractor is responsible for the construction means and methods which in turn are responsible for ensuring that construction does not harm the Waters of Mississippi, the Contractor is solely responsible for ensuring that necessary actions are taken to ensure that no violations of the Waters of Mississippi are incurred.
- D. The erosion control measures must be in place prior to the Contracting Officer approving any requests for payment from the Contractor.

1-03 SUBMITTALS

A. An Erosion Control Plan shall be submitted in accordance with Section 01356.

PART 2 - PRODUCTS

2-01 TEMPORARY BERMS

A. A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills.

B. These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

2-02 TEMPORARY SLOPE DRAINS

A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, sod, or other material that may be used to carry water down slopes to reduce erosion.

2-03 SEDIMENT STRUCTURES

Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

2-04 TEMPORARY SEEDING AND MULCHING

Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.

2-05 BALED HAY OR STRAW CHECKS

- A. Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing 5 cubic feet or more of material.
- B. Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation erosion or water runoff is a problem.

2-06 TEMPORARY SILT FENCES

Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the runoff water.

PART 3 - EXECUTION

3-01 The project drawings show the minimum erosion and siltation control measures required for this job. If the Contractor desires to stockpile construction materials, stone, earth, etc., the location of same and protection thereof shall be outlined in an Erosion Control Plan to be submitted to the Contracting Officer for review.

3-02 CONSTRUCTION REQUIREMENTS

A. The Contracting Officer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent

streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds to the extent directed by the Contracting Officer.

- B. The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the preconstruction stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.
- C. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing, exceed 750,000 square feet without approval of the Contracting Officer.
- D. The Contracting Officer will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.
- E. Under no conditions shall the amount of surface area or erodible earth material exposed at one time by excavation or fill within the project area exceed 750,000 square feet without prior approval by the Contracting Officer.
- F. The Contracting Officer may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.
- G. In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal, State, or Local agencies, the more restrictive laws, rules, or regulations shall apply.

3-03 CONSTRUCTION OF STRUCTURES

A. Temporary Berms

1. A temporary berm shall be constructed of compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches with or without a shallow ditch, constructed at the top of fill slopes or transverse to centerline on fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope

drain must be properly graded to enable this inlet to function efficiently and with only minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately at 10 degree angle with a perpendicular to centerline. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical and until final roadway elevations are approached, embankments should be should be constructed with a gradual slope to 1 side of the embankment to permit the placement of temporary berms and slope drains on only 1 side of the embankment.

B. Sediment Structures

- 1. Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.
- 2. When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and property compacted. The existing ground shall be restored to its natural or intended condition.
- C. Temporary Seeding and Mulching: Seeding and mulching shall be performed in accordance with Section 02480, Seeding and Fertilizing.
- D. Baled Hay or straw Erosion Checks: Hay or straw erosion checks shall be embedded in the ground 4 to 6 inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot, or be removed after they have served their purpose as determined by the Contracting Officer. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris cleanout will be considered routine maintenance.

E. Temporary Silt Fences

- 1. Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are constructed of wire mesh fence with a covering of burlap or some other suitable material on the upper grade side of the fence and anchored into the soil.
- 2. The Contractor hall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the Contracting Officer. The silt accumulation at the fence may be left in place and seeded, removed, etc., as directed by the Contracting Officer. The silt fence becomes the property of the Contractor whenever the fence is removed.

F. Under no circumstances will spent oil wastes be discharged anywhere on the site without the expressed written consent of the State of Mississippi.

3-04 MAINTENANCE

- A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.
- B. The Contractor is responsible for complying with the requirements of the Mississippi Department of Environmental Quality for all erosion control during construction activity.
- C. The Contractor is responsible for maintaining erosion control devices and reporting any maintenance as required by the Mississippi Department of Environmental Quality during construction activity.
- 3-05 EROSION CONTROL OUTSIDE PROJECT AREA: Temporary pollution control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads, and equipment storage sites.

PART 4 - COMPENSATION

4-01 There will be no separate measurement or payment for erosion control.

DIVISION 2 - SITEWORK

SECTION 02111

CLEARING AND GRUBBING

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SECTION 02111

CLEARING AND GRUBBING

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This item shall consist of the removal and satisfactory disposal of trees, except those that may be designated to remain in place, stumps, logs, snags, brush, weeds and other perishable or objectionable material within the limits of project site or along the length of the project as designated.
- B. When specified on the Bid Form as lump sum, this item shall include costs for incidental work required on other non-related items specifically detailed on the Drawings but not listed separately on the Bid Form, which is subsidiary to the completion of that item of work in accordance with the Contract Documents.
- C. This work shall include the stripping and stockpiling of topsoil, stump removal, felling of trees, clearing of brush and other operations as may be detailed herein or indicated on the Drawings.

PART 2 - MATERIALS

2-01 GENERAL

- A. Materials cleared from the site, including merchantable timber, if any, shall become the property of the CONTRACTOR for his disposal unless otherwise noted elsewhere in the Specifications.
- B. The Contractor shall provide equipment of whatever nature is needed to complete the work to the satisfaction of the Contracting Officer. Equipment deemed by the Contracting Officer to be inadequate for the work must be removed from the site.

PART 3 - EXECUTION

3-01 GENERAL

- A. Clearing and grubbing shall be completed a satisfactory distance in advance of earthwork for site preparation, roadways, pipe laying operations etc. and such operations shall not be started until the cleared and grubbed area has been reviewed by the Contracting Officer.
- B. The Contractor shall be responsible for obtaining permits for hauling, dumping, burning, disposal and other operations, as may be required by Local, State and Federal requirements.

3-02 CLEARING AND GRUBBING

- A. The area within the construction limits of the project site shall be cleared of trees, stumps, roots, logs, vegetation and other objectionable matter. Roots over 1-1/2 inches in diameter shall be grubbed out to a minimum depth of 18 inches below original ground or 12 inches below the proposed finished grade in excavated areas. Where indicated on the Drawings or directed by the Contracting Officer, trees that are to remain in place within the project limits, shall be protected from damage by other clearing or construction operations.
- B. Stump holes shall be backfilled and compacted to the density required for subgrades in Section 02200 "Earthwork" where applicable.
- C. When necessary to completely remove grass and small roots from the areas to be covered by earth fill, such as roadways, levees, or other site construction, such areas shall be stripped to sufficient depth to remove same, to the extent directed by the Contracting Officer.
- D. Felling of trees and other clearing operations shall be conducted in a manner that prevents damage to trees that are to remain and to protect existing improvements, structures, utility lines or other items.

3-03 DISPOSAL OF MATERIALS

- A. All merchantable timber shall become the property of the CONTRACTOR for his disposal unless otherwise noted.
- B. Burying of stumps, trees, logs, snags or other vegetative materials will not be permissible within the project site limits unless otherwise provided for in these Specifications.
- C. When permitted by the Contracting Officer, on designated projects, perishable material shall be burned within cleared areas. When on site burning is not permitted, perishable material shall be completely removed from project site to disposal areas provided by the Contractor and approved by the Contracting Officer. Piles for burning shall be placed in the center of cleared areas, and shall be limited in size so that no damage to remaining trees or other vegetation will occur. The Contractor will be responsible for obtaining all permits required and for controlling fires in compliance with all Federal, State and Local laws and regulations for burning. Sufficient watchmen and fire extinguishers shall be provided for constant care of burning material. The Contractor shall submit to the Contracting Officer for review, his proposed method of burning and appropriate precautions for protection of the adjacent areas. The Contractor shall notify the local firefighting unit in advance of burning operations. The Contractor shall furnish and maintain adequate firefighting equipment and personnel at the site during burning operations.
- D. Ashes resulting from burning and incombustible materials such as green roots and debris shall be removed to designated disposal areas provided by the CONTRACTOR and approved by the CONTRACTING OFFICER.

- E. Materials which are stripped from the project site which are not suitable for reuse shall be disposed of by the Contractor at a location provided by him and approved by the Contracting Officer.
- F. The cost of hauling, stockpiling and disposal of material shall be included in the Contract Price bid for Site Work.

PART 4 - COMPENSATION

4-01 There will be no separate measurement and payment for clearing and grubbing.

DIVISION 2 - SITEWORK

SECTION 02200

EARTHWORK

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SECTION 02200

EARTHWORK

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This work shall consist of general grading, excavating, site preparation, hauling, placing, processing, filling, spreading, compacting, and protecting areas to be filled in accordance with these Specifications and in conformity with the lines, grades, slopes, and typical cross sections depicted by the CONTRACT DRAWINGS. Additional information is contained within the Report of Geotechnical Investigation for Short Fork Creek Wastewater Treatment Facility prepared by Aquaterra Engineering, LLC dated August 24, 2002 for the Contractor's reference in accordance with Section 00800.1.6.d of these Specifications.
- B. This item shall also consist of satisfactorily stockpiling materials or disposing of all unsatisfactory materials encountered within the construction limits of the project site. The work includes grading and subgrade construction on roadways and parking areas, water and sewer main construction and site work for buildings and structures, etc.

1-02 EXAMINATION OF SITE

A. The Contractor shall visit the site and inform himself fully of the amount of excavation, filling and grading required under the Contract.

The Contractor shall fully familiarize himself with the surrounding area and the conditions of access under which the project is to be completed.

1-03 CLASSIFICATION OF EXCAVATION

A. All excavation shall be identified as Unclassified Excavation. Additional information concerning site characteristics is contained within the Report of Geotechnical Investigation for Short Fork Creek Wastewater Treatment Facility prepared by Aquaterra Engineering, LLC dated August 24, 2002 for the Contractor's reference in accordance with Section 00800.1.6.d of these Specifications.

PART 2 MATERIALS

2-01 EQUIPMENT

A. CONTRACTOR may use the type of earth moving, compaction, processing, and watering equipment that he desires or has at his disposal, provided the equipment is in satisfactory condition, of adequate design to perform the work efficiently, and is of such capacity and quantity that the construction schedule can be maintained as planned by the CONTRACTOR and approved by the CONTRACTING OFFICER in accordance with the CONTRACT time contained in the AGREEMENT. The CONTRACTOR shall

furnish, operate and maintain such equipment as is necessary to control uniform density, layers of fill and cross sections.

2-02 MATERIALS

A. Material for fills shall consist of material obtained from the excavation of on-site borrow pits. The material used shall be free from vegetable matter and other deleterious substances and shall not contain large rocks or lumps. Fill materials shall consist of select, non-organic and debris free silty clays (CL), clayey silt (ML), sandy clays (CL), or clayey sands (SC) having a plasticity index (PI) within the range of 5 to 25 and a liquid limit less than 45.

B. Lime

1. The lime shall meet all requirements of SECTION 02700.

PART 3 - EXECUTION

3-01 GENERAL REQUIREMENTS

- A. Suitable materials excavated in project site construction shall be used insofar as practicable in the formation of fills, subgrades and shoulders as shown on the DRAWINGS.
- B. Sequence of Operations: No site construction shall be started until erosion control measures have been installed and sufficient clearing, grubbing, stripping, and adequate pipe and drainage work to allow proper drainage within construction limits has been satisfactorily completed to allow earthwork to proceed without interruption.

C. Foundation Preparation:

- 1. When clearing and grubbing has been completed, stump holes remaining in areas to receive fill shall be filled with suitable material and compacted to the specified density.
- 2. The upper 2 feet of wet/unstable soils shall be chemically stabilized using hydrated lime per the requirements of SECTION 02700.
- 3. Prior to placing material on areas to receive fill, the existing ground shall be thoroughly proof-rolled with a roller to prove that the area is of a satisfactory density with stability to begin placement of fill material. Stability shall be determined by proof-rolling with loaded dump trucks or other suitable equipment by the Contractor. At least two (2) full coverage passes over the site should be performed. Any areas that are soft or yielding during proof-rolling should be stabilized as discussed in paragraph 2 above.

D. Excavation:

All excavations shall be kept in compliance with the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926). Shallow excavations (less than 10 ft in depth) shall have temporary slopes no steeper than 1.5 horizontal to 1 vertical where groundwater is not encountered and no steeper than 3 horizontal to 1 vertical where groundwater is present. Deep excavations will require benching, sheeting, or shoring. Sheet pile walls or shoring systems shall be designed by a professional engineer.

Excavation shall be performed at locations indicated on the DRAWINGS, to lines, grades and cross sections shown, and shall be made in such manner that fills can be formed in accordance with the requirements herein. Suitable material encountered within the limits indicated shall be used in the formation of fills. Material not approved for use in fills shall be disposed of in approved Contractor furnished off-site disposal areas or on site if so directed by the Contracting Officer. During the process of excavation, the grade shall be maintained to assure that it will be well drained at all times.

1. The non-organic, non-high plasticity clay debris-free soils removed from the excavated areas should be suitable for use in the embankment. All suitable materials removed from the required excavations shall be utilized in construction of embankments and fills as designated on the Construction Drawings. The Contractor shall organize the excavation and fill such that on-site materials from excavated areas can be used for fill. Excess materials (suitable or unsuitable) shall be wasted or disposed of off-site at a site to be furnished by the Contractor. No separate payment will be considered for the disposal of excess materials (suitable or unsuitable).

The Contractor shall control the excavation work so that the ground surface is properly pitched to prevent water from running into the excavated areas. Water that has accumulated in the excavated areas shall be promptly removed by the Contractor at his expense.

The excavation work may require dewatering. The Contractor shall submit a dewatering plan for approval by the Contracting Officer.

2. Tolerances: Excavation and grading shall be completed to conform to the lines and grades shown on the Drawings. The surface shall conform to the specified grades within 0.5 inches, unless a different tolerance is indicated by the drawings or elsewhere in these Specifications. Deviations shall be corrected by further grading, filling, reshaping and compacting until conformance is obtained.

E. Formation of Fills:

- 1. Fills for project site shall be constructed to lines, grades, cross sections and dimensions shown on the DRAWINGS.
- 2. Earthfills shall be formed by distributing the materials in successive uniform horizontal layers not to exceed nine inches (9") in thickness, loose depth, for the

full width of the cross sections. Each layer of fill shall be compacted to a density of at least ninety-eight percent (98%) of standard Proctor maximum dry density at moisture contents within four percent (4%) below to three percent (3%) above the optimum water content. The Contractor shall spread, scarify, water, or dry the material to achieve the required moisture content. Stability shall be determined by proof-rolling performed by the Contractor.

- 3. The upper surface of the fill shall be shaped to provide complete drainage of surface water at all times. The forming of ruts will not be permitted. The Contractor shall protect the work from erosion and adverse weather conditions.
- 4. Each layer of earthfill shall be compacted as required, with appropriate equipment. Fill material shall be compacted within four percent (4%) below to three percent (3%) above optimum moisture content by processing to dry or watered and properly mixed as needed before being rolled. The furnishing and application of water for construction of fills or processing to dry soils will not be paid for separately; such operations shall be considered as incidental to the formation of fills.
- 5. Construction operations shall be performed in such manner that the simultaneous rolling and placing of material in the same lane or section will not occur. To avoid uneven compaction, the hauling equipment shall traverse, as much as possible, the full width of the cross section. Each layer shall be compacted as required before material for the next layer is deposited.
- 6. Fills and embankments will not be paid for as a separate item. The cost of making fills shall be included in the Lump Sum Bid #1 as specified on the Bid Form.
- F. Subgrade Preparation: Subgrade preparation as specified in this section shall ordinarily apply to the graded section prior to the placing of a course of selected material such as base material.

Prior to preparation of the subgrade, all requirements of paragraph C. above shall be met.

Materials shall not be deposited on the prepared subgrade until it has been checked and approved by the Contracting Officer. When practicable, such prepared subgrade shall be maintained free from ruts and depressions, adequately drained and in a smooth and compacted condition. Damaged subgrade shall be reshaped, recompacted and approved by the Contracting Officer prior to use.

1. When the subgrade material is at the proper moisture content for compaction (as specified by the Contracting Officer), the roadbed or foundation shall be machined and the subgrade material shaped in such a manner that after full compaction, the finished subgrade course shall be the width indicated and closely conform to the lines, grades, and typical section shown on the plans or as specified.

The Contractor shall guard against all irregularities in shape or section and loss of crown or segregation of materials. Proper drainage shall be maintained at all times.

2. After shaping has been completed and the material is at four percent (4%) below to three percent (3%) above the optimum moisture content, the subgrade shall be compacted in accordance with the provisions and requirements specified hereinafter.

Compaction shall be accomplished by rolling with the sheepsfoot rollers and pneumatic-tired traffic rollers of the type heretofore specified. Compaction shall begin at the bottom and continue until the entire area is thoroughly compacted to at least ninety-eight percent (98%) of Standard Proctor maximum dry density with stability present (ASTM D 698). Stability shall be determined by proof-rolling performed by the Contractor. During the compacting, the subgrade shall be maintained at the proper section by light machining or dragging and at the proper moisture content. Final rolling shall be accomplished with pneumatic tired rollers.

3. Lack of uniformity in the mixture, inequalities in the surface or other irregularities shall be corrected by adding or replacing materials and remixing, reshaping, and recompacting as necessary and required.

The Contractor shall be responsible for producing a subgrade, the surface of which shall present a uniform appearance and a smooth riding surface, without sharp breaks or depressions which will collect or hold water. The finished grade and typical section shall be as close to that shown on the Plans as can be constructed with proper and expert manipulation of a motor grader. In no case shall be maximum variation (when tested with a ten foot (10') straight-edge parallel to the centerline) be more than one-fourth inch (1/4").

4. The compacted subgrade will be tested for specified compaction and thickness before acceptance. No minus tolerance in base thickness will be allowed. No density below that specified above will be accepted.

Any areas which do not meet the above requirements shall be corrected by means satisfactory to the Contracting Officer, including rebuilding where necessary.

- G. Foundations: Excavation for structural foundations shall be made at slopes which will provide safe working conditions, or adequate sheet piling shall be installed. Additional information concerning subgrade preparation and foundations is contained within the Report of Geotechnical Investigation for Short Fork Creek Wastewater Treatment Facility prepared by Aquaterra Engineering, LLC dated August 24, 2002 for the Contractor's reference in accordance with Section 00800.1.6.d of these Specifications. Backfill material shall not contain any expansive materials and shall be compacted in lifts to ninety-eight (98%) maximum density with stability present.
- H. Disposal of Excess Material: All excess material and material unsuitable for use in fills shall be disposed of in approved Contractor furnished off-site disposal areas or as directed by the Contracting Officer, in designated on-site areas. Material disposed of on-site shall be placed and graded to field established contours and elevations. After placement of excess material, such fills shall be consolidated by complete coverage with construction equipment. Fills shall be dressed to present a neat appearance before project acceptance.

I. Additional information concerning site preparation, dewatering, and foundation requirements is contained within the Report of Geotechnical Investigation for Short Fork Creek Wastewater Treatment Facility prepared by Aquaterra Engineering, LLC dated August 24, 2002 for the Contractor's reference in accordance with Section 00800.1.6.d of these Specifications.

3-02 SEASONAL AND WEATHER LIMITS

A. No fill material shall be placed, spread or rolled while the ground or fill is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until the moisture content and density of the fill are as previously specified.

3-03 TESTING

- A. Contractor shall be responsible for determining that material utilized in fills meet project requirements and shall provide Atterburg Units, Gradation, Standard Proctor density tests, field density tests, etc. for all materials utilized in fills, foundations or bases. Proctors shall be run as frequently as necessary to assure consistency of material and wherever changes in material are encountered.
- B. Density tests shall be performed at not less than the following interval:
 - 1. Foundation Backfill at least in every second lift of vertical fill, or every 100 CY, whichever is more frequent.
 - 2. Subgrade Fills at least in every second lift of vertical fill in a maximum of 500 linear feet, or every 2000 cubic yards, whichever is more frequent.
 - 3. Road and Street Bases in every lift of each day's production, with spacing in each lift not to exceed 300 feet, and with total yardage per test not to exceed 2000 cubic yards.

PART 4 - COMPENSATION

4-01 There will be no separate measurement or payment for earthwork.

DIVISION 2 - SITEWORK

SECTION 02220

DEWATERING

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PART 1 – GENERAL

SCOPE

1-01

SECTION 02220 DEWATERING

PART 1 - GENERAL

1-01 SCOPE

A. The work provided for herein consists of furnishing all plant, labor, material and equipment and performing all operations required for designing, furnishing, installing and operating a system or systems to dewater the excavation area; maintaining the area free from water during construction operations; and removing the system.

1-02 QUALITY CONTROL

- A. The Contractor shall establish and maintain quality control for all dewatering operations to assure compliance with contracting requirements and maintain records of his quality control for all construction operations, including but not limited to the following:
 - (1) Fabrication and workmanship.
 - (2) Installation, operation and removal.
 - (3) Monitoring free water surface and piezometric elevations.
 - (4) Measuring effluent from dewatering system.
 - (5) Monitoring of sanding.
- B. A copy of these records and tests, as well as the corrective action taken, shall be furnished the Government. Reports of operation and inspection shall include the following data: piezometer elevations, river stages, time of operation of each well, effluent discharge, sanding rates during pump test, problems encountered, proposed actions, and any other pertinent data.

1-03 GENERAL

- A. All permanent work under this contract except as otherwise specified shall be carried on in areas free of water. The Contractor shall design, furnish, install, operate and maintain such facilities necessary to accomplish the following:
 - (1) Collect and dispose of all surface water in the protected area regardless of source.
 - (2) Control and dispose of all surface water around the periphery of the excavation areas to prevent such water from entering the excavation.
 - (3) Lower and maintain the water table at least 5 feet below the bottom of the excavated, and at least 2 feet below the side slopes.
 - (4) Install and monitor construction piezometers.

1-04 DEFINITIONS

A. Dewatering: Dewatering defines the lowering of the ground water below the slopes and bottom of the excavation to ensure dry, firm working conditions and the reduction to

- safe levels of any hydrostatic uplift pressures in any confined foundation strata and/or aquifers which is necessary to ensure the stability and integrity of the foundation.
- B. Dewatering System: Dewatering System defines the machinery, equipment and appurtenances necessary for and related to the accomplishment of dewatering, and the collection and disposal of all surface water within the protected area.
- C. Unwatering: Unwatering is defined as the process of removing all water within an excavation.

1-05 DESIGN

A. The dewatering system shall be designed using accepted professional methods of engineering design consistent with the best current practice. The Contractor shall perform necessary tests and/or analyses of the water and soil environment at the site to satisfy himself that the materials used in his system will not corrode or otherwise deteriorate to such an extent that the system will not perform satisfactorily during the life of the contract. The dewatering plan shall be submitted to the Contracting Officer for review and approval prior to construction of any facilities for dewatering purposes.

1-06 DEWATERING REQUIREMENTS

- A. The dewatering system for the excavation areas as shown on the plans shall be of a type and capacity to accomplish all requirements specified herein.
 - (1) The dewatering system shall be designed, installed and operated to dewater the excavation for gravity interceptors, influent pump station, influent manhole and other structures where groundwater is encountered during excavation.
 - (2) The system shall be of such capacity that it will lower and maintain the free water and piezometric levels, to an elevation at least 5 feet below all earth slopes and excavation surfaces lying within the area, inclusive of the interior slopes of the cofferdam embankments proper. The system shall have sufficient capacity to accomplish this desired result allowing for normal variations in soil properties and foundation conditions.
 - (3) The water level shall be maintained continuously at or below the necessary elevations so that construction operations can be performed without interruption due to wet conditions.
 - (4) No upward or vertical or lateral flow of ground water into the work area will be permitted at any time. The dewatering system shall be designed, constructed and operated at all times so as to prevent movement and/or piping of the foundation, excavation slopes and fill materials. The system shall be operated as necessary during dewatering and unwatering so as to maintain piezometric levels, within the dewatered area, at or beneath the elevation of the water level in the excavation.
 - (5) The system shall consists of wells pumps, sumps, sump pumps, ditches and necessary appurtenances capable, of intercepting seepage before it exits on any interior surface or excavation face and of providing control of surface water. The required dewatering shall be accomplished by using a system of deep wells to lower the piezometric level as required in (3) above to prevent flooding filter materials

- and fresh concrete. Protection of all slopes will be required to prevent erosion under normal surface runoff and construction conditions.
- (6) Initial unwatering of an excavation need not be accomplished by sumping alone, but may utilize sumping in addition to positive dewatering accomplished with a system meeting the requirements of (5) above. Initial unwatering shall at all times fulfill the requirements of (4) above.
- (7) Burying of headers will be allowed only in areas and to depths absolutely necessary for protection against damage at construction equipment crossing. The effluent from the dewatering system will be required to be discharged into the nearest waterbody where positive drainage away from the site can be accomplished. The water shall be controlled to prevent erosion or damage to the existing natural ground.
- (8) A system of construction piezometers will be required to monitor free water surface elevations and piezometric elevations to evaluate the effectiveness of the dewatering system in fulfilling the requirements specified herein. Piezometers shall be of adequate numbers and in suitable arrangements and depths for determining the free water surface elevations and piezometric elevation over the area. A minimum of three piezometers shall be installed with the dewatering system. The piezometer construction shall consist of PVC riser pipe and screen (ASTM 1785, Schedule 40). Care shall be taken during construction to ensure that the piezometers are not damaged. The piezometers will be removed after the completion of construction. See paragraph 3.2 for submittal and approval of piezometer details and installation procedures. The Contractor shall make a minimum of one reading per piezometer, per 24-hour period, a minimum of 20 hours apart, based on a 7-day week. These piezometer readings, along with corresponding short fork creek stage readings, shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be directed as to the number and time that these readings are required. If additional readings are directed, an equitable adjustment in the contract unit price for dewatering will be made.
- (9) The system shall include mechanical means for measuring the effluent from each well as well as the total effluent of the dewatering system. Devices and technique used in measurement shall be acceptable to the Contracting officer. The Contractor shall make a minimum of one reading per instrument, per 24-hour period, a minimum of 20 hours apart, based on a 7-day week. These instrument readings, along with corresponding creek stage readings, shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be directed as to the number and time that these readings are required. If additional readings are directed, an equitable adjustment in the contract unit price for dewatering will be made.
- (10) The system shall be designed, installed and operated in a manner which will preclude removal of materials from the foundation by the pumping operation (hereafter referred to as "sanding"). After installation, each well shall be individually pump-tested at maximum design flow to verify acceptability with respect to sanding. Any well or wellpoint segment found sanding at a rate exceeding one pint per 25,000 gallons of effluent during the individual pump-test of maximum design flow shall be replaced in a manner acceptable to the Contracting Officer, and at no additional cost to the Government.

(11) The rate of unwatering the excavation shall not exceed 5 feet per day for the first 10 feet and one foot per day thereafter until completely unwatered.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3-01 INITIAL TESTING

A. Upon installation of the system, the Contractor shall test and evaluate the completed system to demonstrate to the satisfaction of the Contracting Officer that the system is, in fact, capable of performing the intended dewatering operation as outlined herein. This testing shall include complete falling head tests to be conducted on each piezometer.

3-02 REVIEW OF SYSTEM DESIGN AND PERFORMANCE

The Contractor shall submit to the Contracting Officer, for review, details of his A. proposed dewatering facilities, including the type of system, planned layout and sizes of wells, headers, including all lengths requiring burial, collectors, ditches, piezometers, sumps and pumps; capacities of standby pumping and power supply facilities; number, type, location, proposed method of installation, and proposed methods of testing of piezometers; facilities for measuring the flow of water pumped from each well of the dewatering system; facilities for monitoring of sanding; provisions for disposal of water riverside of the mainline levee from the dewatering system; and plan of operation. This submittal shall include the design capacity of each well at the design stage, and shall be submitted no later than 30 days prior to installation of the system. The Contractor's proposed dewatering facilities will be reviewed for general design concept. The Contractor retains full responsibility for design, installation, operation, safety and performance of the system, facilities, and its components. The Contractor shall install the entire dewatering system and shall make no reduction to the planned system without the prior written approval of the Contracting Officer. If during the progress of the work, the installed dewatering system proves inadequate to meet the requirements specified, including piezometers, the Contractor shall, at his expense, furnish, install and operate such additional dewatering facilities and/or make such changes, either in features of the system or the plan of operation, as may be necessary to perform the required dewatering in a satisfactory manner. Such changes and additions shall be approved in writing by the Contracting Officer prior to being made.

3-03 MAINTENANCE AND SERVICING

A. The Contractor shall be responsible for the maintenance, servicing and repairs of the entire dewatering system and appurtenances during the life of the contract, including replacement of any and all wells, and piezometers found performing unsatisfactorily.

3-04 STANDBY PUMPING EQUIPMENT POWER

- A. The Contractor shall furnish standby pumping equipment power as follows:
 - (1) Diesel or liquid petroleum gas prime movers for pumps shall have 50% standby equipment.
 - (2) Portable electric generators shall have 100% connected standby equipment.
 - (3) Commercial electric power, if available, shall have 100% standby electric generating equipment.

3-05 REMOVAL

The dewatering facilities required to maintain a dry condition within the protected area Α. shall be maintained until completion of the work within the protected area, and then shall be completely removed. However, no dewatering facilities of any kind shall be removed without prior approval of the Contracting Officer. All wells, pumps and appurtenances employed in the dewatering system and all materials other than earth shall remain the property of the Contractor, and shall be removed by him from the site of the work. All holes shall be plugged as follows: The riser pipes for all wells and piezometers shall be completely removed and filled with bentonite-cement grout. However, the screens of the deep well system may remain upon approval of the Contracting Officer. Plugging shall be accomplished by inserting a grout pipe to the full depth of the well or riser pipe and the grout either poured or pumped in as the riser pipe is removed. The grout for plugging the hole shall consist of a mixture of portland cement, bentonite, and water proportioned as directed by the Contracting Officer. The water percentage may be varied for a more effective plugging job. The grouting of abandoned wells and piezometer riser pipes in lieu of removing them will not be permitted unless approved by the Contracting Officer.

DIVISION 2 - SITEWORK

SECTION 02232

GRANULAR BASE COURSE

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SECTION 02232

GRANULAR BASE COURSE

PART 1 - GENERAL

1-01 REQUIREMENTS

A. Applicable provisions of the General Conditions and of Division 1 - General Requirements govern all work specified in this Section.

1-02 SCOPE

- A. Furnish granular base course to the extent and thickness indicated on the plans.
- B. Except as otherwise directed by the Contracting Officer, all granular base will be as herein specified and as indicated on the plans.
 - 1. Meet or exceed applicable requirements of and place in accordance with Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition, Section 304, Granular Courses.

PART 2 - PRODUCTS

2-01 AGGREGATE

A. Meet all requirements of Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition, Section 703.07, Class 4, Group C (Crushed Limestone)

2-02 GEOTEXTILE FABRIC

A. Meet all requirements of Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition, Section 714.13, Type VI.

PART 3 - EXECUTION

- 3-01 GENERAL, MIXING, SPREADING, SHAPING, COMPACTION, MAINTENANCE, THICKNESS REQUIREMENTS AND SURFACE REQUIREMENTS
- A. Meet or exceed all applicable requirements of Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition, Section 304, Granular Courses, for mixing and installation.

3-02 GEOTEXTILE FABRIC STABILIZATION

A. Meet or exceed all applicable requirements of Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition, Section 209, Geotextile Fabric Stabilization, for installation.

3-03 TESTING

- A. All testing required under this section will be performed by an independent testing laboratory under the direction of the Contracting Officer and paid for by the Contractor.
- B. Testing Required:
 - 1. Density of limestone aggregate, Type A Base AASHTO T-85.
 - 2. Density of other aggregates, Type A Base AASHTO T-84 and T-85.
 - 3. Density of Type B Base AASHTO T-99.
- C. Testing for compliance to the specifications (density) will be required for each 2,000 square yards of installed base with daily testing of the mixture for gradation requirements.
- 3-04 CLEAN-UP
- A. Refer to Division 1.

PART 4 - COMPENSATION

4-01 There will be no separate measurement or payment for granular base course.

DIVISION 2 - SITEWORK

SECTION 02271

FILTER CLOTH AND EROSION CONTROL FABRIC

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4-01 NO SEPARATE MEASUREMENT

SECTION 02271

FILTER CLOTH AND EROSION CONTROL FABRIC

PART 1 - GENERAL

1-01 REQUIREMENTS

A. Applicable provisions of the General Conditions and of Division 1 - General Requirements govern all work specified in this Section.

1-02 SCOPE

A. Prior to the delivery of any filter cloth or erosion control fabric to the job site, submit to the Contracting Officer for approval two copies of affidavits from the manufacturers of the filter cloth and erosion control fabric describing the materials proposed for use on the project. Deliver no materials to the job site until submittals have been approved in writing. Submit samples if and as requested by the Contracting Officer.

B. Protections:

- 1. Coordinate and protect all items of related installations and existing or new work with filter cloth or erosion control fabric installation.
- 2. During construction, provide all necessary construction procedures to protect workmen and adjacent facilities.
- 3. Protect all underground and exposed appurtenances during and after construction as required to obtain the necessary approval and acceptance of the system upon the completion of the project.

C. Storage and Handling:

- 1. Store all materials delivered to the site at suitable storage facilities to adequately protect all materials from damage or deterioration in any way. Handle materials with care to prevent breakage, contamination or other damage. Materials delivered in unopened containers may be stored in same. Any damaged or deteriorated materials will be rejected.
- 2. Special caution should be exercised when outdoor storage of materials is utilized due to the destructive effects of prolonged sunlight and moisture on filter cloth and erosion control fabric.

PART 2 - PRODUCTS

2-01 MATERIALS

A. Filter Cloth for Silt Fence:

1. Mirafi fabrics as manufactured by Mirafi, Inc., Charlotte, North Carolina 28224:

100 x woven.

2. Contracting Officer approved equal.

B. Erosion Control Fabric:

- 1. Curlex III (HV) as manufactured by American Excelsior Company, 3846 Delp St., Memphis, TN, 38118, 1-800-365-7302.
- 2. C-350 as manufactured by North American Green, Inc., 1-800-772-2040.
- 3. Xcel Permamat 100 as manufactured by PPS Packaging Co., Fowler, California, 559-834-1641.
- 4. Contracting Officer approved equal.

PART 3 - EXECUTION

3-01 INSTALLATION

A. Silt Fence

- 1. As recommended by silt fence manufacturer.
- B. Erosion Control Fabric: All erosion control fabrics shall be installed per the manufacturer's recommendations or the following, whichever is greater.
 - 1. Prepare the subgrade areas to receive seeding and fertilizer as per Section 02200, Earthwork.
 - 2. Seed and fertilize areas shown on the plans as per Section 02480, Seeding and Fertilizing.
 - 3. Prepare 4 inch trenches 1 foot back from the crown and at the bottom of the slope of the channel.
 - 4. Tuck the beginning or edge of the fabric into the upper trench, secure every 9 inches with 12 inch staples (to be supplied by fabric manufacturer) and cover with soil.
 - 5. Lay the fabric in the direction of water flow, securing with 6 inch staples (to be supplied by fabric manufacturer) every 9 inches to 1 foot apart on edges and overlaps, 3 feet apart down the center of each roll.
 - 6. Overlap edges and ends of adjoining rolls 4 inches minimum.
 - 7. Drape fabric to provide close contact with the soil. Do not stretch fabric.

- 8. Tuck the end or opposite edge of the fabric into the lower trench and secure as in 3-01, B, 4.
- 3-02 CLEAN-UP
- A. Refer to Division 1.

PART 4 - COMPENSATION

4-01 There will be no separate measurement or payment for this item.

DIVISION 2 - SITEWORK

SECTION 02272

RIPRAP

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PART 3	 CONSTRUCTION REQUIREMENTS
3-01	SUBGRADE PREPARATION
3-02	INSTALLATION OF GEOTEXTILE FABRIC
3-03	PLACING LOOSE RIPRAP
3-04	CLEAN UP

RIPRAP

PART 1. GENERAL

1-01 SCOPE OF WORK: In accordance with the requirements of this Section, the Contractor shall furnish and place stone riprap of the type to the depth designated and in reasonably close conformity with the lines, grades and thicknesses shown on the Drawings.

The work shall consist of furnishing and placing geotextile fabric under all riprap.

PART 2 - MATERIALS

2-01 STONE RIPRAP: Aggregate for stone shall be dense, free of clay or shale seams, resistant to the actions of air and water, approximately rectangular in shape, and suitable in all other respects for the purpose intended. Quality requirements for rock to be furnished under these Specifications will be checked or tested by the Contracting Officer prior to use and subsequently if deemed appropriate.

Stone for riprap shall meet the requirements for size by weight of the mass as follows:

Mississippi Department of Transportation Standard Specifications for Road and Bridge Construction, Section 705, 300 Lbs. Rip-Rap.

	Percent
Weight	(by weight of the mass)
300 lbs to 60 lbs	80%
20 lbs to 59 lbs.	10%
5 lbs to 19 lbs	10%

This gradation sets out minimum requirements for the large stone per size designation. The Contractor shall furnish material well graded with the smaller stones such that a homogeneous blanket of riprap will result with all interstices reasonably well filled with rock.

2-02 GEOTEXTILE FABRIC:

A. The filter cloth material used as a base for rip-rap shall be pervious sheets of strong, rot-proof plastic fabric meeting the following Specifications:

	Physical Property	Test Method (latest Revision)	Acceptable Test Results	
	Tensile Strength, wet, lbs.	ASTM D-1682	200 (min.)	
	Elongation, wet, %	ASTM D-1682	40 (min.)	
	Coefficient of Water Permeability, cm/scc	Constant Head	.03 (min.)	
	Puncture Strength, lbs.	ASTM D-751	100 (min.)	
(max.)	Pore Size - EOS	Corps of Contracting	Officers	40
	II C Standard Sieve	CW 02215		

U.S. Standard Sieve CW-02215

- B. The Contractor shall furnish a certified laboratory test report from an approved testing laboratory with each shipment of materials. Laboratory test reports shall include actual numerical test data obtained on this product.
- C. Pins may be any commercially available pin 6 inches in length capable of retaining a washer.
- D. Washers may be any commercially available washer 2 inches in diameter and compatible with the pin.
- E. The pins and washers shall be manufactured from corrosion resistant metal material.

2-03 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures

PART 3 - CONSTRUCTION REQUIREMENTS

3-01 SUBGRADE PREPARATION: Prior to placement of the geotextile fabric or the placement of riprap, the slopes or ground surface shall be shaped to the lines and grades indicated on the Drawings or directed by the Contracting Officer, and shall be thoroughly compacted by use of mechanical or hand tamps. Unless otherwise stipulated or directed, slopes shall not be steeper than the natural angle of repose of the material upon which riprap is to be placed.

The outer edges and the top of the riprap where the construction terminates shall be formed so that the surface of the riprap will be embedded and even with the surface of the adjacent slope or ground, and the bottom of the riprap shall be placed at least two feet below the natural ground surface unless otherwise directed.

3-02 INSTALLATION OF GEOTEXTILE FABRIC:

A. Placing Filter Fabric:

- 1. Filter fabric shall be placed on the prepared and compacted subgrade within the limits shown on the plans for stone rip-rap. The filter fabric shall be laid loosely without wrinkles or creases. When more than one width or length of filter fabric is necessary, the joints shall be overlapped a minimum of 24 inches. Securing pins with washers shall be inserted through both strips of overlapped material and into the materials beneath until the washer bears against the fabric and secures it firmly to the base material. These securing pins shall be inserted through the overlapped fabric at not greater than 2 foot intervals along a line through the midpoint of the overlap. If the fabric is torn or damaged, a patch overlapping the edges of the damaged area by 2 feet shall be sewn securely to the fabric with a continuous, monofilament, rot-proof material.
- 3-03 PLACING LOOSE RIPRAP: Riprap stone shall be as large as can be conveniently placed in a layer of the required depth. In layers two feet (2') or less in depth, the stones, with the exception of small stones and spalls used to chink interstices, shall weigh between fifty pounds and one hundred pounds (50-100) with at least sixty percent (60%) of the stones weighing more than one hundred (100) pounds each.

The bed for the riprap shall be shaped and trimmed to provide even surfaces. A footing trench shall be excavated along the toe of the slope.

When the required riprap is less than twenty inches (20") in depth, stone shall be placed by hand. Stone shall be placed to provide a minimum of voids.

The larger stones shall be placed in the toe return, foundation course, and on the outer surface of the riprap.

Stones shall be placed with their longitudinal axis normal to the face of the embankment and so arranged that each rock above the foundation course has at least a three (3) point bearing on the underlying stones. Bearing on smaller stones shall be chinked with small stones and spalls. The finished surface shall be even and tight and shall not vary from the planned surface by more than three inches (3") per foot of depth.

When the required riprap is twenty inches (20") or more in depth, the stones may be placed by dumping and spread in layers by bulldozers or other suitable equipment.

Random riprap shall not be less than eighteen inches (18") in thickness.

3-04 CLEANUP: Upon completion of the Work, the Contractor shall clean the surface of the riprap, remove and dispose of all surplus material and debris, and leave the site in a neat and presentable condition.

DIVISION 2 - SITEWORK

SECTION 02273

PAVED DITCHES

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PAVED DITCHES

PART 1 - GENERAL

1-01 SCOPE OF WORK: In accordance with the provisions of the Section, the Contractor shall construct paved ditches of Portland Cement Concrete constructed at the locations and to the lines, grades and typical cross sections shown on the plans or as established.

PART 2 - MATERIALS

2-01 GENERAL: The materials used in this construction shall meet the requirements specified for Portland Cement Concrete in Division 3. If reinforcement is specified for ditch invert pavement, the reinforcement shall be welded wire mesh fabric, of the weight per square as shown on the plans and shall be as specified also in Division 3.

PART 3 - CONSTRUCTION REQUIREMENTS

3-01 EXCAVATION AND SUBGRADE PREPARATION: The subgrade for paved ditches shall be formed by excavating to the required depth below the prepared finished surface grade of the paved ditch in accordance with the dimensions and design indicated on the plans or as directed.

The subgrade shall be compacted to 95% of the standard effort (ASTM D 698) maximum dry density.

3-02 CONCRETE: Insofar as applicable, all materials shall meet the requirements specified in Division 3.

Concrete shall be a mixture containing a minimum cement content of 1.25 barrels of cement per cubic yard. The compressive strength of the concrete when tested at 28 days age, shall be 2500 pounds per square inch, minimum. The minimum cement content may be increased and the quantities and proportions of fine and coarse aggregate may be reduced from the theoretical amounts as necessary to produce the required compressive strength and work-ability but the water/cement ratio shall in no case exceed the maximum allowed in the table of proportions.

A template mounted on the side forms of wood or steel shall be used in striking off and finishing the surface of the concrete to the required shape and dimensions shown on the plans. The entire unit shall be constructed monolithic with smooth fillets or curves at all angles or breaks in flow lines. Concrete shall be placed by beginning at the bottom of the slope and progressing upward.

- Expansion joints shall be constructed at the locations indicated on the plans or as directed, and shall be of the specified dimensions.
- 3-03 BACKFILLING AND CLEANING UP: After the ditch pavement has set sufficiently the forms shall be removed and the spaces around the paved ditch shall be backfilled with suitable material and thoroughly compacted. The ditch slopes shall be neatly trimmed and all surplus material disposed of as directed. All sod removed during the construction of this work shall be replaced with suitable sod, and the entire work shall be left in a neat and presentable condition.

DIVISION 2 - SITEWORK

SECTION 02367

PRESTRESSED CONCRETE PILES

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PRESTRESSED CONCRETE PILES

PART-1 - GENERAL

- 1-01 SECTION INCLUDES
 - A. Prestressed Precast Concrete Piles.
 - B. Pile Load Tests.
- 1-02 RELATED SECTIONS
 - A. Section 02200 EARTHWORK.
 - B. DIVISION 3 CONCRETE.
- 1-03 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 - A. American Association of State Highway and Transportation Officials and Prestressed Concrete Institute (AASHTO-PCI) Publication:
 - STD 112 Standard Prestressed Concrete Piles.
 - B. American Concrete Institute (ACI) Publications:
 - ACI 211.1 Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
 - ACI 315 Details and Detailing of Concrete Reinforcement
 - ACI 318 Building Code Requirements for Reinforced Concrete
 - C. American Society for Testing and Materials (ASTM) Publications:
 - A 82 Cold-Drawn Steel Wire for Concrete Reinforcement

 A 416 Uncoated Seven-Wire, Stress-Relieved Strand for Prestressed
 Concrete
 - A 421 Uncoated Stress-Relieved Wire for Prestressed Concrete
 - A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - C 33 Concrete Aggregates

C 150 Portland Cement

C 494 Chemical Admixtures for Concrete

D 1143 Method of Testing Piles Under Static Axial Compressive Load

- D. American Welding Society (AWS) Publication:
 - D1.4 Structural Welding Code Reinforcing Steel

1-04 SUBMITTALS

- A. Experience: The piling Contractor shall submit evidence that he has been engaged in the successful installation of prestressed concrete piles for at least 5 years.
- B. Shop Drawings: Submit for piles showing placement of the steel and that piles conform to the strength requirements shown on the structural design drawings. Show the use of special embedded or attached lifting devices, the employment of pick-up points, support points other than pick-up points, or any other method of pick-up on the shop drawings. Drawings shall conform to ACI 315.
- C. Contractor-Furnished Mix Design: Submit a concrete mix design before concrete is placed, for each type of concrete used for the piles.

1-05 CONSTRUCTION RECORD DOCUMENTS

- A. Submit two copies of daily construction record documents. These documents shall show all information pertinent to the installation of the piles including, but not limited to the following:
 - 1. Weather conditions.
 - 2. General site conditions.
 - 3. Number and type of personnel.
 - 4. Size, depths, and location of piles.
 - 5. Sequence of placing.
 - 6. Name and title of person in charge.
 - 7. Number of blows to drive the last foot.

1-06 PROJECT CONDITIONS

- A. Protect nearby structures from damage.
- B. Perform driving during daylight hours.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Cement: ASTM C 150, Type I.
- B. Water: Use potable water.

- C. Aggregates: ASTM C33, except as modified herein; free from any substance which may be deleteriously reactive with the alkalines in the cement in an amount sufficient to cause excessive expansion of the concrete. Do not mix, store in the same stockpile, or use fine aggregates from different sources of supply alternately in the same concrete mix or the same structure without approval.
- D. Admixtures: If required, use Type A or B of ASTM C 494. Do not use admixtures containing chlorides.
- E. Prestressing Steel: Use seven-wire stress relieved strand conforming to ASTM A 415 of stress relieved wire conforming to ASTM A 421. Use prestressing steel free of grease, oil, wax, paint, soil, dirt, and loose rust. Do not use prestressing strands or wire having kinks, bends, or other defects.
- F. Reinforcing Steel: ASTM A 615, Grade 60. Weld reinforcing steel in accordance with AWS D 1.4.
- G. Ties and Spirals: Steel, ASTM A 82.

2-02 CONCRETE

A. Contractor-Furnished Mix Design: ACI 211.1 or ACI 318, Chapter 4. The concrete shall have a minimum compressive strength of 5000 psi at 28 days. The maximum size aggregate shall be 3/4 inches.

2-03 FABRICATION OF PRETENSIONED PILES

- A. General: Piles shall be pretensioned concrete piles. Workmanship shall conform to standard commercial practice in prestressing plants.
- B. Formwork: Provide forms of metal, well braced and stiffened against deformation, accurately constructed, watertight, and supported on unyielding casting beds. Forms shall permit movement of the pile without damage during release of the prestressing force. Tolerances:
 - 1. Length 3/8 inch per 10 foot of length.
 - 2. Cross Section +1/2 inch to 1/4 inch.
 - 3. Deviation from Straight Lines Not more than 1/8 inch per 10 feet of length.
 - 4. Pile Head $\pm 1/4$ inch per foot of head dimension from true right angle plane. Surface irregularities $\pm 1/2$ inch.
- C. Pretensioning: Anchorages for tensioning the prestressing steel shall be a type approved by the Contractor. Measure the tension to which the steel is to be pretensioned by the elongation of the steel and verify by the jack pressure reading on a calibrated gauge.

2-04 PREPARATION

- A. Produce each pile of dense concrete straight with smooth surfaces with the reinforcement retained in its proper position during fabrication. Vibrator heads shall be smaller than the minimum distance between steel for pretensioning. The plane of the heads of piles shall be perpendicular to the axis of the pile. Chamfer, a minimum of 5/8 inch, the ends of all piles and the corners of square piles. Do not remove concrete piles from the forms until the concrete has attained a compressive strength of at least 4,000 psi.
- B. Curing of Piles: Moist or steam cure piles. Moist cure using water, moist burlap coverings, plastic sheeting, or membrane curing compound for a period of 21 days.

(OR)

After placement of concrete, moist cure for a period of 4 hours then steam cure for a period of 12 hours. After steam curing, moist cure using either water or membrane curing until a total steam and moist curing time of 72 hours is achieved.

- C. Detensioning: Release tension in the strands from the anchorage gradually. Perform the transfer of prestressing force when the concrete has reached a compressive strength of not less than 4,000 psi. Following the detensioning and cut-off of the strands, coat or seal the ends of the strands with rust prohibiting compound.
- D. Obtain prior approval of hammer to be used. Use driving method which will not cause damage to nearby structures.
- E. Verify site conditions will support driving equipment for performance of pile driving operations.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Protect piles during handling and pile head during driving using cushion cap.
- B. Deliver hammer blows on central axis of pile shell. Select a pile hammer which has sufficient weight and energy to suitable install the specified pile without damage. The pile hammer used for driving shall be the same type, operated at the same rate and in the same manner as that used for driving the test pile.
- C. Driven piles shall have a minimum depth and have a minimum carrying capacity as shown on the plans.
- D. Jetting of piles is not permitted.
- E. Pre-augering shall be no greater than used to install test pile.
- F. Cut off piles with a smooth level cut leaving the reinforcing to dowel into the pile.

3-02 TOLERANCES

- A. Maximum: 1 in 48 from vertical for plumb piles.
- B. Top: Maximum three inches from location indicated.

3-03 NON-CONFORMING PILES

- A. Non-conforming Piles: Piles that are driven out of position, or are damaged.
- B. Provide additional piles or supplement piles to meet specified requirements.

3-04 GENERAL

A. Unless otherwise provided, all pile hammers, regardless of the type pile being driven, shall develop an energy per blow at each full stroke of the piston of not less than one and one-half (1 ½) foot-pounds for each pound of weight driven. In no case shall the total energy developed by the hammer be less than fifteen thousand (15,000) foot-pounds per blow. In no case shall a gravity or drop hammer be used to drive concrete piles.

3-05 TEST PILE

- A. The test piles shall be of the type and shall be placed in a manner as specified herein to an elevation used for bid purposes. For this project 2 piles will be tested, one in the vicinity of Boring #B-49 and one in the vicinity of Boring # B-42. Test loads shall not be applied prior to concrete attaining 5000 psi minimum compressive strength. The test pile, if it provides a safe design capacity as determined by the results of a satisfactory load test, shall be used in the finished work.
- B. Load test shall be in accordance with ASTM D 1143. An independent testing laboratory, approved by the Contracting Officer, shall observe the test and record and analyze the data. The test load shall be 2 times the design capacity or to a minimum head deflection equal to 10% of the pile diameter, whichever is greater.
- C. No separate item will be made for the load testing of the test pile. Include this cost in the related unit prices.
- 3-06 Pile Hammer Formulas: When not driven to practical refusal (20 blows per inch), the bearing values of piles shall be determined by load tests as specified herein. In the absence of loading tests, safe bearing values will be determined by the following formulas:

	2WH	for single-acting
P=	S + 0.2	steam/air hammers
		and open cylinder
		diesel hammers

	2H(W+Ap)	For double-acting
P=	S + 0.1	steam hammers

Where

P =safe bearing value in pounds

W = weight, in pounds, of striking parts of hammer

H = height of fall in feet

A = area of piston in square inches

p = steam/air pressure in pounds per square inch at the hammer

S = the average penetration in inches per blow for the last

10 to 20 blows for steam/air hammers

These formulas are applicable for the following conditions only:

The hammer has a free fall.

The head of the pile is not broomed or crushed.

The penetration is reasonably quick and uniform.

There is no appreciable bounce after the blow.

A follower is not used.

When there is appreciable bounce of the hammer, twice the height of the bounce shall be deducted from "H" to determine its value in the formula.

Formulas for pile hammers not covered herein must be approved by the Contracting Officer.

PART 4 COMPENSATION

4-01 MEASUREMENT

A. Acceptable piling in place will be measured per linear foot (LF). For permanent prestressed concrete piles required to be cut off in lengths greater than one foot and the cut-offs are not necessitated by damage to the pile or as a result of a pile furnished in a length greater than that established by the pile list on the Bid Form, the Contractor will be paid \$30.00 per cutoff for sizes smaller than 20" and \$40.00 per cutoff for sizes 20" and larger for such cutting off. No measurement will be made for failed test piles.

4-02 PAYMENT

Payment will be for acceptable piling at their respective contract unit price per linear foot (LF) for the types and size specified on the Bid Form.

DIVISION 2 - SITEWORK

SECTION 02480

SEEDING AND FERTILIZING

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SEEDING AND FERTILIZING

PART 1 - GENERAL

1-01 QUALITY ASSURANCES

A. Conform to the requirements and regulations of the Mississippi Department of Agriculture.

PART 2 - PRODUCTS

2-01 MATERIALS

A. Topsoil:

- 1. Furnish, at expense, sufficient topsoil to properly install all work as specified herein, and as shown on the drawings, if the quantity of stored topsoil is inadequate.
- 2. Topsoil furnished will be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity, obtained from naturally well-drained areas and not excessively acid or alkaline nor containing toxic substances which may be harmful to plant growth. It will be without admixture of subsoil, cleaned and reasonably free from clay lumps, stones, stumps, roots or similar substances two inches or more in diameter, debris or other objects which might be a hindrance to planting operations.

B. Lime:

1. Ground limestone (Dolomite) containing not less than 85 percent of total carbonates and ground to such a fineness that 50 percent will pass through a 100-mesh sieve and 90 percent will pass through a 20-mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve.

C. Commercial Fertilizer:

1. 13-13-13 formula, 13% nitrogen, 13% phosphoric acid, 13% potash, conforming to the applicable state fertilizer laws, uniform in composition, dry and free flowing, and delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

D. Water:

1. Clean, fresh potable water.

E. Grass Seed:

- 1. The requirements of the Mississippi Department of Agriculture apply. No "below standard" seed will be acceptable.
- 2. Grass seed furnished under these specifications will be packed in new bags that are sound and not mended.

2-02 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures.

PART 3 - EXECUTION

3-01 INSTALLATION

A. Proceed immediately, when other work has progressed sufficiently, to commence work on planting, including placing of topsoil to finished grade. Thereafter, conduct the planting operation under favorable weather conditions during the next season or seasons which are specified herein. Plant only within the period specified herein.

3-02 TIME OF SOWING

A. The grass seed percentages listed below indicate quantity by weight percent.

1. Fall:

a. Seed mixture for Fall seeding will be 60% Kentucky 31 Fescue, 30% annual rye grass, and 10% white clover, sown during the period of September 15 to December 1 at the rate of 90 pounds per acre.

2. Spring:

a. Seed mixture for Spring seeding will be 70% Kentucky 31 Fescue, 10% annual rye grass, and 20% unhulled Bermuda grass when applied from April 1 to July 1 at a rate of 90 pounds per acre.

3. Summer:

- a. Seed mixture for summer seeding will be 50% hulled Bermuda and 50% unhulled Bermuda when applied from July 1 to September 15 at a rate of 90 pounds per acre.
- 4. Do not seed during windy weather, nor when the ground surface is frozen, wet or otherwise non-tillable. No seeding shall occur during December 1 to April 1 without written approval of the Contracting Officer.

3-03 SEEDING

- A. Plant all disturbed areas with little vegetative cover where sodding is not to occur, as shown on the drawings.
- B. Grade and uniformly compact the subsoil so that it will be parallel to the proposed finished grade.
- C. After subgrade soil has been prepared, spread the topsoil evenly thereon and lightly compact. Spread no topsoil in a frozen or muddy condition.
 - 1. Bring areas to be seeded to finished grade and smooth.
 - 2. Scarify and smooth areas where the topsoil has not been removed and remove sticks, stones and rubbish.

D. Soil Improvements:

- 1. Apply lime at the rate of 2 tons per acre to the areas being prepared for planting.
- 2. Apply commercial fertilizer at the rate of 1000 pounds per acre to the areas being prepared for planting.

E. Planting:

1. Immediately before any seed is to be sown, scarify the ground as necessary and rake until the surface is smooth, friable and of uniformly fine texture. Seed evenly at the rate designated in Section 3.02, lightly rake, roll with a 200-pound roller, and water with a fine spray. The method of seeding may be varied as required to establish a smooth, uniform turf composed of the grasses specified.

F. Mulching:

1. Cover all seeded areas with a 1-inch minimum thickness layer of weed-free straw or other approved mulch, and wet thoroughly.

3-04 MAINTENANCE

- A. Maintain the grass seeding, without additional compensation, for not less than 90 days after finishing the sowing, and then until final completion of the Contract. Regrade, reshape, protect, sprinkle, remove obnoxious weeds and perform such other work required to produce a satisfactory condition. Grass coverage will be 90% minimum for acceptance. No eroded areas will be allowed.
- B. Re-seed all grass that does not show satisfactory growth or a uniform stand in accordance with the provisions and requirements set out herein, at no cost to the Government.

3-05 CLEAN-UP

A. Refer to Section 00800.

DIVISION 2 - SITEWORK

SECTION 02485

BERMUDA SOD

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BERMUDA SOD

PART 1 - GENERAL

1-01 RELATED WORK

- A. The following related work is specified in other Sections:
 - 1. Section 02810: Irrigation System
 - 2. Section 02490: Trees, Plants & Ground Cover

1-02 SCOPE

A. This section covers all labor, tools, material and equipment required to furnish and install Bermuda sod at the locations shown on the drawings and as hereinafter specified.

1-03 QUALITY ASSURANCE

A. Conform to the requirements and regulations of the Mississippi Department of Agriculture.

PART 2 - PRODUCTS

2-01 MATERIALS

A. Sod:

- 1. Live, dense, well-rooted growth of 419 Bermuda sod, free from Johnson grass, nutgrass, other obnoxious grasses or weeds, diseases, pests, and any and all other debris or materials which would deter or prevent growth after placement; also uniform in color, leaf texture and density. Sod grown on peat will not be allowed. Protect against dehydration, contamination and overheating during transportation and delivery.
- 2. Cleanly cut sod in strips having a reasonably uniform thickness of not less than 3/8 inches, a reasonably uniform width of not less than 8 inches, and a length of not less than 12 inches. Thatch to be a maximum thickness of 1/2 inch (uncompressed).
- 3. Delivered sod to be stored on pallets and tagged with the botanical and common name of the sod species. Do not stack more than two feet deep and keep in a moist condition. Do not allow delivery of more sod than can be installed within 24 hours, although slightly longer periods may be allowed in cool weather with prior written permission of the Designer.

B. Lime:

1. Refer to Section 02480, Subsection 2-01,B.

- C. Fertilizer:
 - 1. Refer to Section 02480, Subsection 2-01, C.
- D. Topsoil:
 - 1. Refer to Section 02480 Subsection 2-01,A.
- E. Water:
 - 1. Clean, fresh potable water.

PART 3 - EXECUTION

3-01 SODDING

- A Place sod only when the soil is moist, unfrozen and favorable to growth. No sodding will be permitted between December 1 and March 1 without written approval of the Designer.
- B. Bring the area to be sodded to the lines and grades shown on the drawings or as directed by the Designer. Place all sod on topsoil. Loosen the surface of the ground to be sodded to a depth of not less than 1 inch with a rake or other scarifying device. Sprinkle the topsoil if necessary until saturated for a minimum depth of 2 inches and keep moist until the sod is placed.
- C. Apply fertilizer and lime immediately prior to placing the sod to the prepared surface of the topsoil at the rates specified in Section 02480, Subsection 3-02.
- D. Place the sod as soon as possible after removal from the point of origin. Carefully place sod by hand on the prepared topsoiled surface with the edges in close contact at the bottom of slopes. Lay the first row of sod in straight lines with the long dimension of pads parallel to slope contours. Butt joints side to end with the end joints staggered in adjacent rows. Do not stretch or overlap sod. Fit each pad of sod laid and pound into place using tamps or other suitable implements. On slopes of two to one or steeper, use wooden pegs driven through each pad of sod as required to prevent slippage.
- E. Immediately after placing, thoroughly set the sod with a roller weighing not more than 150 lbs. per foot of roller width. Water sod and soil to a depth of 4 inches within 4 hours after rolling.

3-02 MAINTENANCE AND ESTABLISHMENT

A. Thoroughly water sod during the first week after planting to keep in a moist condition. Water as required thereafter to ensure growth until final project acceptance. Re-sod all areas larger than 1 square foot not having uniform stand of grass. Sodded areas will be considered acceptable at final project acceptance if they are free from weeds, debris and trash, and are thoroughly covered with a stand of densely growing Bermuda grass. No eroded areas will be allowed.

- 3-03 CLEAN-UP
- A. Refer to Section 00800.

DIVISION 2 – SITEWORK

SECTION 02490

TREES, PLANTS AND GROUND COVER

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TREES, PLANTS AND GROUND COVER

PART 1 - GENERAL

1-01 RELATED WORK

- A. The following related work is specified in other Sections:
 - 1. Section 02485: Bermuda Sod
 - 2. American Standard for Nursery Stock, American Association of Nurserymen, inc., Revised Edition, October 27, 1980.

1-02 SCOPE

A. This section covers all labor, tools, equipment and materials required to provide all proposed landscaping as shown on the drawings.

1-03 QUALITY ASSURANCE

- A. Perform all work with personnel experienced in the work required in this section under the direction of a skilled foreman.
- B. Plant names indicated comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tag.
- C. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock." A plant shall be dimensioned as it stands in its natural position.
- D. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, provided the larger plants will not be cut back to size indicated. Provide plants indicated by two measurements so that only a maximum of 25% are of the minimum size indicated and 75% are of the maximum size indicated.
- E. Provide "specimen" plants with a special height, shape or character of growth. Tag specimen trees or shrubs at the source of supply. The Contracting Officer will inspect specimen selections at the source of supply, when possible, for suitability and adaptability to selected location. When specimen plants cannot be purchased locally, provide sufficient photographs of the proposed specimen plants for approval.
- F. Plants may be inspected and approved at the place of growth for compliance with specification requirements for quality, size and variety.
 - 1. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.

1-04 SUBMITTALS

- A. Submit the following material samples:
 - 1. Mulch

- 2. Guy Wire
- 3. Wooden Stakes
- B. Submit the following materials certification:
 - 1. Mulch
 - 2. Plant Fertilizer
- C. Upon plant material acceptance, submit written maintenance instructions recommending procedures for maintenance of plant materials.

1-05 DELIVERY, STORAGE AND HANDLING

- A. Deliver fertilizer materials in original, unopened and undamaged containers showing weight, analysis and name of manufacturer. Store in manner to prevent wetting and deterioration.
- B. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray deciduous plants in foliage with an approved "Anti-Desiccant" immediately after digging to prevent dehydration. Dig, pack, transport and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order to stock, and on arrival the certificate shall be filed with the Contracting Officer. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to the Contracting Officer. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches.
- C. Cover plants transported on open vehicles with a protective covering to prevent windburn.
- D. Provide dry, loose topsoil for planting bed mixes. Frozen or muddy topsoil is not acceptable.

1-06 PROJECT CONDITIONS

- A. Work Notification: Notify Contracting Officer at least 7 working days prior to installation of plant material.
- B. Protect existing utilities, paving and other facilities from damage caused by landscaping operations.
- C. A complete list of plants, including a schedule of sizes, quantities and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.

1-07 WARRANTY

A. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of 1 year, beginning from the date of written approval for the planting installation from the project Contracting Officer.

- B. Inspection and replacement of dead, diseased or unhealthy plant material shall be made during the designated warranty period every 3 months. Replace plant material in accordance with the drawings, specifications, and size and quality requirements.
- C. Plant materials replaced during the warranty period shall be warranted for 1 calendar year from the date of replacement.
- D. Warranty shall not include damage or loss of trees, plants or ground covers caused by fires, floods, freezing rains, lightning storms or winds over 75 miles per hour, acts of vandalism or negligence on the part of the Government.
- E. Remove and immediately replace all plants, as determined by the Contracting Officer, that are unsatisfactory during the initial planting installation.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Plants: Provide plants typical of their species or variety with normal, densely-developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sunscald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers and all forms of infestation. All plants shall have a fully developed form without voids and open spaces. Plants held in storage will be rejected if they show signs of growth during storage.
 - 1. Dig balled and burlapped plants with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock." Cracked or mushroomed balls are not acceptable.
 - 2. Container-Grown Stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
 - a. No plants shall be loose in the container.
 - b. Container stock shall not be pot bound.
 - 3. Provide tree species that mature at heights over 25'-0" with a single main trunk. Trees that have the main trunk forming a "Y" shape are not acceptable.
 - 4. Plants planted in rows shall be matched in form.
 - 5. Plants larger than those specified in the plant list may be used when acceptable to the Contracting Officer.
 - a. If the use of larger plants is acceptable, increase the spread of roots or root ball in proportion to the size of the plant.
 - 6. The height of the trees, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated in the plant list.
 - 7. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark on all edges.

- 8. Shrubs and small plants shall meet the requirements for spread and height indicated in the plant list.
 - a. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.
 - b. Single stemmed or thin plants will not be accepted.
 - c. Side branches shall be generous, well-twigged, and the plant as a whole well-bushed to the ground.
 - d. Plants shall be in a moist, vigorous condition, free from dead wood, bruises, or other root or branch injuries.

2-02 ACCESSORIES

- A. Topsoil for Planting Beds: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks and other foreign materials, with acidity range of between pH 6.0 and 6.8.
 - 1. Identify source location of topsoil proposed for use on the project.
 - 2. Provide topsoil free of substances harmful to the plants which will be grown in the soil.

B. Fertilizer:

- 1. Plant Fertilizer Type "A": Commercial type approved by the Contracting Officer containing 13% nitrogen, 13% phosphoric acid, and 13% potash by weight; 1/4 of nitrogen in the form of nitrates, 1/4 in form of ammonia salt, and 1/2 in form of organic nitrogen.
- C. Anti-Desiccant: Protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration; mixed and applied in accordance with manufacturer's instruction.
- D. Mulch: Premium grade shredded pine bark 3/8" to 1" diameter. Furnish in 3 cubic foot bags or bulk, or 6 months old well rotted shredded native hardwood bark not larger than 4" in length and 1/2" in width free of wood chips and sawdust.
- E. Water: Free of substances harmful to plant growth. Hoses or method of transportation furnished by Contractor.
- F. Stakes: As indicated in the planting details.
- G. Guying/Staking Wire: No. 12 gauge galvanized wire.
- H. Staking and Guying Hose: Two-ply reinforced garden hose not less than 1/2" inside diameter.
- I. Planting Soil Mixture: Shall consist of 2/3 existing soil, finely tilled, and 1/3 sharp construction grade sand.

PART 3 - EXECUTION

3-01 INSPECTION

A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected.

3-02 PREPARATION

A. Time of Planting:

- 1. Evergreen Material: Plant evergreen materials between September 1 and December 1 or in spring before new growth begins. If project requirements require planting at other times, plants shall be sprayed with anti-desiccant prior to planting operations.
- 2. Deciduous Material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.
- 3. Planting times other than those indicated shall be acceptable to the Contracting Officer.
- B. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.
- C. Locate plants as indicated or as approved in the field after staking by the Contractor. If obstructions are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected.
- D. Excavate circular plant pits with vertical sides, except for plants specifically indicated to be planted in beds. Provide shrub pits at least 12" greater than the diameter of the root system and 24" greater for trees. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a depth of 4". Remove excavated materials from the site.
- E. Provide pre-mixed planting mixture for use around the balls and roots of the plants consisting of 2/3 finely tilled topsoil and 1/3 sharp sand and 1/2 lb. plant fertilizer Type "A" for each cubic yard of mixture.

3-03 INSTALLATION

- A. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb and faced to give the best appearance of relationship to each other or adjacent structure. Set plant materials 2"-3" above the finish grade. No filling will be permitted around trunks or stems. Backfill the pit with planting mixture. Do not use frozen or muddy mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water.
- B. After balled and burlapped plants are set, muddle planting soil mixture around bases of balls and fill all voids.
 - 1. Remove all burlap, ropes and wires from the tops of balls. Remove all synthetic burlap wrap completely.
- C. Space ground cover plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within 12" of the trunks of trees and shrubs within planting bed and to within 6" of edge of bed.

D. Mulching:

1. Mulch tree and shrub planting pits and shrub beds with required mulching materials 3" deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.

2. Mulch ground cover beds with mulch 2" deep immediately after planting.

E. Staking/Guying:

- 1. Stake-guy all trees immediately after lawn seeding or sodding operations and prior to acceptance. When high winds or other conditions which may affect tree survival or appearance occur, the Contracting Officer may require immediate staking/guying.
- 2. Stake deciduous trees under 3" caliper. Stake evergreen trees under 8'-0" tall.
- 3. Guy deciduous trees of 3" caliper. Guy evergreen trees over 8'-0" tall.

F. Pruning:

- 1. Prune branches of deciduous stock, after planting, to balance the loss of roofs and preserve the natural character appropriate to the particular plant requirements. In general, remove 1/4 to 1/3 of the leaf bearing buds; proportion shall in all cases be acceptable to the Contracting Officer. Remove or cut back broken, damaged and unsymmetrical growth of new wood.
- 2. Multiple Leader Plants: Preserve the leader which will best promote the symmetry of the plant. Cut branches flush with the trunk or main branch at a point beyond a lateral shoot or bud a distance of into less than 1/2 the diameter of the supporting branch. Make cut on an angle.
- 3. Prune evergreens only to remove broken or damaged branches.

G. Care of Existing Trees:

- 1. Selectively prune existing trees in designated area, under Contracting Officer's direction. Remove sucker shoots and dead, rubbing and damaged branching.
- 2. Fertilize designated existing trees with 2 to 3 lbs. of Type "A" plant fertilizer per inch of trunk diameter for trees less than 6" diameter, and 3 to 5 lbs. for trees greater than 6" diameter.
 - a. Fertilize in early spring before growth begins or in later October.
 - b. Fertilize at 2' to 3' on center in a triangular pattern to a depth of 18" within the dripline.
 - c. Injection or drilling fertilization methods, when used, shall be acceptable subject to Contracting Officer.
- 3. Water existing trees every 2 weeks until acceptance. Water thoroughly with a fine mist sprinkler head, soaker hose or hose at a low flow rate over the entire drip line area as required to allow water to penetrate to a depth of 12" to 12".

3-04 MAINTENANCE

A. Maintain plantings until completion and acceptance of the entire project.

- B. Maintenance shall include pruning, cultivating, weeding, watering and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.
 - 1. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.
 - 2. Tighten and repair guy wires and stakes as required.
 - 3. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.
 - 4. Water trees, plants and ground cover beds within the first 24 hours of initial planting, and not less than twice per week until final acceptance.

3-05 ACCEPTANCE

- A. Inspection to determine acceptance of planted areas will be made by the Contracting Officer upon Contractor's request. Provide notification at least 10 working days before requested inspection date.
 - 1. Planted areas will be accepted provided all requirements, including maintenance, have been complied with and plant materials are alive and in a healthy, vigorous condition.
- B. Upon acceptance, the Government will assume plant maintenance.

3-06 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris and equipment. Repair damage resulting from planting operations.

DIVISION 2 - SITEWORK

SECTION 02500

STORM DRAINAGE

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STORM DRAINAGE

PART 1 - GENERAL

1-01 DESCRIPTION

A. This item shall consist of furnishing all materials, labor, tools, equipment, and incidentals and performing all work necessary for the installation of pipe culverts, curb inlets, catch basins, and concrete headwalls and other specials in accordance with the Contract Documents. The work shall include all excavation, grading, backfill and other incidentals necessary for the installation of drainage structures as specified herein.

1-02 APPLICABLE DOCUMENTS

- A. The following publications form a part of this Specification and where referred to by basic designation only, are applicable to the extent indicated. Reference is to the later edition of each unless specified otherwise.
 - 1. American Society for Testing and Materials (ASTM):
 - a. C-76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - b. C443 Joints for Circular Concrete Sewer and Culvert Pipe.
 - c. C478 Precast Reinforced Concrete Manhole Sections.
 - 2. American Concrete Institute (ACI):
 - a. ACI 301 Specifications for Structural Concrete for Buildings.
 - b. ACI 318 Building Code Requirements for Reinforced Concrete.
 - 3. American Concrete Pipe Association
 - a. Concrete Pipe Design Manual.
- B. Local Building Codes: Any City, County and State Codes applying to the work.
- C. Standard Specifications for Road and Bridge Construction (MSHD): 1990 edition, as referenced herein.

1-03 SUBMITTALS

- A. Certified Test Reports: Before delivery of materials and equipment, certified copies of the reports of all tests specified herein or elsewhere shall be submitted to the Contracting Officer for review. The testing shall have been performed in a laboratory meeting the Contracting Officer's approval. Test reports shall be accompanied by notarized certificates from the manufacturer certifying that the tested material and equipment is of the same type, quality, manufacture and made as that proposed to be supplied.
- B. Concrete Pipe: Certified copies of test reports shall include strength tests of concrete pipe. Strength tests for concrete piping shall be the three edge bearing tests. Test reports shall be furnished prior to installation of piping.
- C. Shop Drawings: Contractor shall supply shop drawings as specified herein or as directed by the Contracting Officer. Review of shop drawings by the Contracting Officer shall be required prior to incorporation of the subject item into the work.

PART 2 - MATERIALS

2-01 REINFORCED CONCRETE PIPE: Shall conform to ASTM C76, Class III, Wall B minimum, unless otherwise specified. Joints shall be rubber gasket or bituminous plastic. Jointing shall be in conformance with the manufacturer's recommendations, applicable ASTM Standards, and MSHD Standards.

2-02 CONCRETE

- A. Cement, reinforcement, forms, jointing and other incidentals shall be as specified in the Section 03300 "Cast in Place Concrete".
- B. All concrete work shall be in accordance with the provisions of "Building Code Requirements for Reinforced Concrete", ACI 318 and ACI 301. Any questions regarding acceptable concrete practice shall be decided by reference to ACI 301 and to ACI Standards listed in Chapter 4 of ACI 318.

2-03 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.
- B. The failure of the Contracting Officer to order the use of bracing or sheeting or the failure to order sheeting, bracing, struts, or shoring to be left in place, shall not in any way or to any extent relieve the Contractor of any responsibility concerning the condition of any excavation. Any delay resulting in keeping the excavation open longer than would have otherwise have been necessary, shall not relieve the Contractor of responsibility for properly and adequately protecting the excavation from caving or slipping at all times, nor from any of his obligations under the Contract relating to injury of persons or property.

C. Installation of sheeting and shoring, or shoring left in place by the Contractor shall not entitle the Contractor to any claim for extra compensation.

2-04 INCIDENTAL MATERIALS

- A. Masonry brick shall conform to the standard specifications for sewer brick, made from clay or shale, ASTM C-32, Grade MS.
- B. Mortar: Portland Cement Mortar shall consist of one (1) part Portland Cement complying with ASTM C-150, Type 1, and three (3) parts mortar sand and sufficient water to mix mortar to proper consistency.
- C. Gray iron casting shall conform to the standard specifications for gray iron castings ASTM A-48, Class 25.
- D. Manhole Steps: Steps for manholes shall be cast aluminum alloy meeting the requirements of the Aluminum Association (Alloy AA-514) and Federal Specifications G4A.
- E. Foundations: Shall be either poured in place reinforced concrete as detailed, or precast sections set on undisturbed earth or select bedding, where ordered by the Contracting Officer or detailed on the drawings. Concrete shall be Class "B" as specified in Section 03300, "Cast in Place Concrete" herein.
- F. Flared End Section: Shall be of the same class and type of pipe installed where specified.

PART 3 - EXECUTION

3-01 EXCAVATION

- A. General: The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated or as otherwise specified.
- B. During excavation, material suitable for backfilling in the opinion of the Contracting Officer shall be stock piled in an orderly manner a sufficient distance from the banks of trench to avoid overloading and to prevent slides or cave ins. All excavated materials not required or not suitable for backfill shall be removed and wasted as approved by the Contracting Officer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved method.

3-02 TRENCHES

A. The trenches shall be of the necessary width for the proper laying of the pipe, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded and shaped to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portion of the pipe where it is necessary to excavate for pipe bells or joints.

- B. Depressions for joints shall be dug after the trench bottom has been graded in order that the pipe rest upon the prepared bottom for as nearly its full length as practicable. Depressions shall only be of such length, depth and width as required for properly making the particular type of joint.
- C. Care shall be exercised not to excavate below the depth indicated. Over excavated depths shall be backfilled with loose, granular, moist earth, and thoroughly tamped.
- D. The width of the trench at and below the top of the pipe and the trench wall shall not exceed the pipe O.D. plus 16 inches.
- E. The pipe bedding shall be in conformance with the plans and the recommendations of the American Concrete Pipe Association. The pipe bed shall be prepared to the Contracting Officer's complete satisfaction.
- F. Whenever unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such soil shall be removed for the full width of the trench and to the depth required. The trench shall be backfilled to the proper grade with an aggregate composed of coarse sand, fine gravel or other suitable material approved by the Contracting Officer. The backfill shall be thoroughly compacted and shaped to form a bed for the pipe.
- G. Select backfill or bedding hauled in from off site shall be measured and paid for separately. Use of select backfill from on site excavations shall not be eligible for separate or additional payment.
- 3-03 DEWATERING: The Contractor shall perform all pumping or well pointing necessary to perform the excavation and to maintain excavation in dry state during the work. This shall be an absorbed cost and shall not be measured for separate payment.

3-04 BACKFILLING

- A. General: The trenches shall be carefully backfilled with the excavated materials, approved for backfilling. The backfill material shall be tested every 100 lf or each days production, if less than 100', with one test for each vertical foot of fill. Testing shall be paid for by the Contractor.
 - The pipe backfill shall be in conformance with the plans and the recommendations of the America Concrete Pipe Association.
- B. Backfill material shall consist of earth, loam, sandy clay, sand and gravel or other approved materials free from large clods of earth or stones. Backfill shall be carefully rammed and compacted in place.
- C. Trenches within roadways or other areas to be paved shall be backfilled to the top of the subgrade or the ground surface in 6 inch layers, and each layer shall be compacted to a density at least 95% of maximum density as determined by AASHTO Method T-99. The surface shall be graded to conform with the surrounding ground surface.

- D. Trenches in open areas shall be backfilled to a point one (1) foot above the top of the pipe in 6 inch layers. Each layer shall be compacted to a density of at least 90% of the maximum density as determined by AASHTO T-99. The remainder of the backfill above the 1 foot level shall be properly and carefully compacted to the density of the adjacent earth, and the surface shall be mounded over the trench and left in a uniform and neat condition satisfactory to the Contracting Officer.
- E. Trenches improperly backfilled in the opinion of the Contracting Officer shall be reopened to the depth required for proper inspection, then refilled and recompacted as specified. There shall be no extra compensation for such corrective work.

3-05 PIPE LAYING

- A. Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe and tongue ends of tongue and groove pointing in the direction of flow in the case of concrete pipe.
- B. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to avoid sudden off sets of the flow line. As the work progresses, the interior of the pipe shall be cleared of all dirt and superfluous materials of every description.
- C. Trenches shall be kept free of water and pipe shall not be laid when the condition of the trench or the weather is unsuitable for such work.
- D. Pipe shall be plugged or sealed at the end of each work day to inhibit the entrance of foreign objects into the line.

3-06 JOINTS

- A. Concrete Pipe: Joints shall be rubber gasket complying with ASTM C-443 or bituminous plastic sealer in accordance with MSHD Standard Section 707.04 as specified herein.
 - 1. All rubber gaskets shall be extruded or molded and cured in such a manner that any cross section will be dense, homogeneous, and free of porosity, blisters, pitting, and other imperfections. The gaskets shall be extruded or molded to the specified size within a tolerance of + 6% on any dimension, measured at any cross section. The rubber gasket shall be fabricated from a high grade rubber compound. The basic polymer shall be natural rubber, synthetic rubber or a blend of both acceptable to the purchaser.
 - 2. Bituminous plastic sealer shall be composed of a steam refined petroleum asphalt or of a refined coal tar, dissolved in a suitable solvent and stiffened with a mineral filler. The sealer shall be a smooth uniform mixture, not thickened or livered; it shall show no separation which cannot be easily overcome by stirring. The material shall be of such consistency and properties that it can be readily applied with a trowel, a putty knife, or a caulking gun without pulling or drawing. The material, when applied to pipe surfaces, shall exhibit good adhesive and cohesive properties and shall have only slight shrinkage after curing. The material shall be capable of being exposed to below freezing temperatures without incurring damage.

3-08 CONSTRUCTION OF CATCH BASINS AND STORM MANHOLES

- A. Brick masonry and concrete work for catch basins and manholes shall be constructed in conformity with the details shown on the Contract Drawings.
- B. Where irons or other fittings enter the brick work, they shall be placed as the work is laid up, thoroughly bonded, accurately spaced and lined. Upon completion of the masonry and settings of castings and fittings, the inside and outside surfaces of the brick masonry shall be neatly plastered with mortar to the thickness of one half (1/2) inch. Plastering shall be finished to a uniform, smooth surface and neatly pointed to all fittings.
- C. The concrete or brick and mortar shall be carefully constructed around the inlet and outlet pipes so as to prevent leakage and form a neat connection.
- D. Catch basins and manholes may be constructed partially or totally of precast reinforced concrete manhole sections and specials. All precast units shall comply with ASTM C-478 and joints shall be preformed plastic joints. Preformed plastic joint compound shall meet Federal Specification SS-S-SS-00219 and AASHTO M-198.

3-09 CLEAN-UP

A. After backfill of pipe and structures is completed, the area shall be graded to conform with the surrounding ground or to grade indicated, as applicable. The Contractor shall dispose of all surplus material, dirt and rubbish. Surplus material shall be deposited at locations and in a manner approved by the Contracting Officer.

3-10 INSPECTION

- A. Prior to final approval of the system, the Contractor and Contracting Officer shall conduct a thorough inspection of the entire installation. Any indication of defects on material or workmanship or any obstruction to the flow in the pipe system shall be corrected.
- B. All defects shall be corrected by the Contractor without additional compensation and in a manner acceptable to the Contracting Officer.
- 3-11 MAINTENANCE: The Contractor shall be responsible, until final acceptance and without extra compensation, for the maintenance of all sewers and structures to the lines and grades established for the construction, for the stability of all backfills and the finished grades above the sewers and around the structures, and for the repair and replacement of all items which were damaged or removed during the construction. Restoration of pavement, base courses, driveways, curb and gutter, sidewalks and other items shall conform to the requirements specified in other sections of the Specifications.

DIVISION 2 - SITEWORK

SECTION 02557

CONCRETE DRIVEWAYS

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SECTION 02557

CONCRETE DRIVEWAYS

PART 1 - GENERAL

1-01 SCOPE OF WORK: In accordance with the provisions of this Section, the Contractor shall construct Portland cement concrete driveways on a prepared subgrade in accordance with these specifications, at the locations, and in conformity with the lines, grades and typical sections, as shown on the plans or as designated.

PART 2 - MATERIALS

- 2-01 GENERAL: Insofar as applicable, all materials shall meet the requirements specified in Division 3.
- 2-02 Concrete for driveways shall be a mixture containing a minimum cement content of 1.25 barrels of cement per cubic yard. The compressive strength of the concrete when tested at 28 days age, shall be 2500 pounds per square inch, minimum. The minimum cement content may be increased and the quantities and proportions of fine and coarse aggregate may be reduced from the theoretical amounts as necessary to produce the required compressive strength and workability but the water/cement ratio shall in no case exceed the maximum allowed in the table of proportions.
- 2-03 JOINT FILLER: Expansion joints shall be premolded bituminous fiberboard of the non-extruding resilient type as specified. Joint sealants will not be required.

PART 3 - CONSTRUCTION REQUIREMENTS

- 3-01 SUBGRADE PREPARATION: The subgrade shall be shaped and compacted per the recommendations of the geotechnical report. Loose rocks or pieces of broken concrete shall be buried to a depth of at least 18 inches below the subgrade elevations and all holes and depressions backfilled and compacted in 6 inch layers to the specified density.
- 3-02 FORMS: Either wood or metal forms may be used.

The lumber used for wood forms shall be dressed, free from bulges or warps, of uniform width, and sound and free from loose knots.

Flexible metal forms shall be used for the turn out radii at connection to roadway. Metal side forms shall present a smooth surface and have a flat surface on top.

All forms shall be sufficiently thick to withstand the weight of the concrete placed against them without bulging and shall be securely staked and braced, sufficiently tight to prevent leakage of mortar, and held firmly, to the required line and grade. They shall be of a depth at least equal to the depth of the driveway section and shall be cleaned thoroughly and oiled before concrete is placed against them.

3-03 PLACING CONCRETE: The concrete used in the construction of driveways shall be manufactured, proportioned and placed in accordance with the requirements of Division 3.

Prior to the placing of any concrete the subgrade shall be tested with a template cut true to cross section of the proposed construction, all irregularities corrected and compacted, and the entire subgrade sprinkled with water.

Immediately after mixing, the concrete shall be deposited in a single layer on the moist subgrade to such depth that after finishing it shall be to the full thickness required. The edges, sides, etc., shall be thoroughly spaded, and the surface tamped sufficiently to compact the concrete and bring mortar, for finishing, to the surface.

- 3-04 FINISHING: The concrete shall be struck-off with a transverse template resting upon the side forms, and shall be floated, with an approved float, in such a manner that excess water, laitance, or other inert material shall be removed from the surface. When the surface of the concrete is free from water and just before it obtains its initial set, it shall be gone over and finished with a wooden float so as to produce a sandy texture.
- 3-05 EXPANSION JOINTS: Concrete driveways shall be constructed monolithic from the roadway to the end of the driveway section.

A transverse expansion joint filler shall be installed for full depth at the end of the driveway where connection is made to sidewalk or concrete structure. No dowels or joint sealant will be required for expansion joints. Any expansion joint material extruding after concrete is finished shall be trimmed off flush with the surface.

- 3-06 CONTROL JOINTS: Longitudinal and transverse control joints shall be sawed, hand cut, or premolded filler at 10'-0" O.C. maximum.
- 3-07 PROTECTION AND CURING: After the driveway is completed, it shall be protected and cured in accordance with the requirements of Division 3.
- 3-08 BACKFILLING AND CLEANING UP: When the concrete has set sufficiently, the sides of the driveway shall be backfilled to the required elevation with suitable material, which shall be tamped in layers of not more than six (6) inches until firm and solid. All surplus material shall be disposed of as directed, and the completed work and the site shall be left in a neat and presentable condition.

DIVISION 2 - SITEWORK

SECTION 02558

CONCRETE SIDEWALK

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SECTION 02558

CONCRETE SIDEWALK

PART 1 - GENERAL

1-01 SCOPE OF WORK: In accordance with the provisions of this Section, the Contractor shall construct Portland Cement Concrete sidewalks in one course on a prepared subgrade in accordance with these specifications and in conformity with the lines, grades, thickness, and typical cross sections shown on the plans.

PART 2 - MATERIALS

- 2-01 GENERAL: Insofar as applicable, all materials shall meet the requirements specified in Division 3.
- 2-02 CONCRETE: Concrete for sidewalks shall be a mixture containing a minimum cement content of 1.25 barrels of cement per cubic yard. The compressive strength of the concrete, when tested at 28 days, shall be 2500 pounds per square inch, minimum. The minimum cement content may be increased and the quantities and proportions of fine and coarse aggregate may be reduced from the theoretical amounts as necessary to produce the required compressive strength and workability but the water/cement ratio shall in no case exceed the minimum allowed in the table of proportions.
- 2-03 STEEL REINFORCEMENT: If specified on the Drawings, welded wire fabric for concrete reinforcement shall conform to the Specifications for "Welded Steel Wire Fabric for Concrete Reinforcement." ASTM-A185. The weld shear strength requirement for these Specifications shall be extended to include a wire size differential up to and including six (6) gauges.
- 2-04 JOINT FILLER: Fillers for expansion joints shall be premolded bituminous fiberboard of the non-extruding resilient type as specified. Joint sealants will not be required.

PART 3 - CONSTRUCTION REQUIREMENTS

3-01 SUBGRADE PREPARATION: Excavation for the subgrade of the sidewalk shall be made true to the lines and grades shown on the plans or as established, and the entire subgrade area shall be rolled or tamped until it is hard and solid, prior to the placing of any concrete. If required, the subgrade shall be sprinkled with water to aid in securing thorough compaction. Any soft, spongy or other unsuitable material encountered shall be excavated as directed and replaced with suitable material, thoroughly tamped in place.

The subgrade shall be compacted per the recommendations of the geotechnical report.

3-02 FORMS: Either wood or metal forms may be used.

The lumber used for wood forms shall be dressed, free from bulges or warp, of uniform width, and sound and free from loose knots.

Metal forms shall be of approved sections, shall present a smooth surface and have a flat surface on top.

All forms shall be at least 2 inches nominal thickness, to withstand the weight of the concrete placed against them without bulging and shall be securely staked, and braced sufficiently tight to prevent leakage of mortar and held firmly to the required line and grade. They shall be of a depth at least equal to the depth of the sidewalk section and shall be cleaned thoroughly and oiled before concrete is placed against them.

3-03 PLACING CONCRETE: Immediately before placing the concrete the subgrade shall be tested with a template cut true to cross section of the proposed construction, all irregularities corrected and compacted, and the entire subgrade sprinkled with water.

Immediately after mixing, the concrete shall be deposited in a single layer on the moist subgrade to such depth that after finishing it shall be to the full thickness required. The edges and sides and joints shall be thoroughly spaded, and the surfaces tamped sufficiently to compact the concrete and bring mortar, for finishing, to the surface.

3-04 FINISHING: The concrete shall be struck-off with a transverse template resting upon the side forms, and shall be floated with an approved float, in such a manner that excess water, laitance, or other inert material shall be removed from the surface. Where additional concrete is necessary, it shall be added and floating operations continued until the entire surface of the concrete is uniform in texture.

When the surface of the concrete is free from water and before it obtains its initial set, it shall be finished with a wooden float so that a sandy texture is produced. The surface may be sprinkled with a light coating of cement and screened sand and worked into the concrete, if necessary to produce a satisfactory finish. No plastering will be permitted. The longitudinal surface variations shall be not more than one-quarter (1/4) inch under a ten (10) foot straightedge, nor more than one-eighth (1/8) inch on a five (5) foot transverse section. The surface of the concrete shall be finished so as to drain completely at all times.

The edges of the sidewalk shall be carefully finished and rounded with an edging tool having a radius of one-half $(\frac{1}{2})$ inch. The expansion joints shall be edged with an edger having a radius of one-quarter $(\frac{1}{4})$ inch.

The surface of the sidewalk shall be divided into blocks with an approved grooving tool and the groove shall have a depth of not less than one (1) inch. Where the width of the sidewalk does not exceed six (6) feet, the grooves shall be spaced at intervals equal to the approximate width of the sidewalk. When the sidewalk exceeds six (6) feet in width, the grooves shall be spaced at intervals equal to approximately one-half (½) the width of the sidewalk and in addition, a longitudinal groove shall be provided along the center line of the sidewalk. All edges of the grooves shall be carefully finished and edged with an edger having a radius of one-quarter (¼) inch, after which, all marks caused by edging, or otherwise, shall be removed with a wetted brush or wood float so as to give the surface a uniform texture and finish.

- 3-05 EXPANSION JOINTS: Joint filler shall be one-half (½) inch thick premolded asphalt impregnated fiber of the non-extruding and resilient type as specified in Division 3. Unless otherwise shown on the plans, the distance between expansion joints shall not exceed 30 feet. The premolded filler shall be cut to the full transverse width and depth of the concrete sidewalk.
 - Expansion joint filler shall be installed at all points where the side-walk joins the curb or where the sidewalk contacts driveways, walls or other rigid structures. Castings or grating frames in the sidewalk area shall be surrounded by expansion joint filler. Any expansion joint material extruding after the concrete has expanded shall be trimmed off flush with the surface. No joint sealant will be required.
- 3-06 PROTECTION AND CURING: Immediately after finishing the concrete, it shall be protected and cured in accordance with the provisions and requirements of Division 3.
 - Any section which is damaged, before final acceptance of the work, shall be removed and reconstructed by the Contractor without extra compensation.
- 3-07 BACKFILLING AND CLEANING UP: When the concrete has set sufficiently, the sides of the sidewalk shall be backfilled to the required elevation with suitable material, which shall be tamped in layers of not more than six (6) inches until firm and solid. All surplus material shall be disposed of as directed, and the completed work and site shall be left in a neat and presentable condition.

DIVISION 2 - SITEWORK

SECTION 02560

SANITARY SEWERAGE - PROCESS PIPING

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SECTION 02560

SANITARY SEWERAGE - PROCESS PIPING

PART 1 - GENERAL

1-01 DESCRIPTION

- A. In accordance with the requirements of these Specifications, the Contractor shall furnish and install materials and perform work necessary for or incidental to constructing a sanitary sewer process piping system for the Wastewater Treatment Facility complete and ready for use.
- B. The work shall include excavation, trenching and backfilling; furnishing and installing trench sheeting, shoring and bracing; furnishing and installing pipe, specials, services, manholes and related appurtenances; storage and protection of materials; testing, cleanup and other operations necessary to complete the work in accordance with the Specifications and Drawings.
- C. Inspection, when used in this specification, means visual observation of materials, equipment, or construction work, on an intermittent basis, to determine that the work is in conformance with the contract documents and the design intent. Such inspection does not constitute acceptance of the work, nor shall it be construed to relieve the Contractor in any way from his responsibility for the means and methods of construction or for SAFETY on the construction site.
- 1-02 CONTRACTOR'S EQUIPMENT: The Contractor shall provide and maintain the equipment necessary to prosecute the work in an orderly and safe manner. The equipment shall consist of suitable units designed or selected to perform and expedite the work and incidental items of construction.

1-03 CONFLICTS WITH OTHER UTILITIES

- A. Where the location of the sewer is not clearly defined by dimensions on the Drawings or unless otherwise directed by the Contracting Officer, the sewer shall not be laid closer horizontally than ten feet (10') to a water supply main except that where the bottom of the water pipe will be at least eighteen inches (18") above the top of the sewer pipe, horizontal spacing may be a minimum of six feet (6'). Water and sewer pipe shall NOT be laid in the same trench. Where gravity flow sewers cross above water lines, the sewer pipe, for a distance of ten feet (10') each side of the crossing, shall be either ductile iron pressure pipe without any joint closer horizontally than eight feet (8') to the crossing or shall be fully encased in concrete.
- B. Where sewer construction conflicts with underground utilities which are indicated to remain in place, the Contractor shall be fully responsible for protecting these facilities and for restoring the portions of those lines which are damaged or severed as a result of his operations. Where existing lines in conflict are indicated to be removed by others, the

Contractor shall cooperate with the Owner of these utilities to the end that these conflicts may be removed prior to excavation for the sewers.

1-04 APPLICABLE DOCUMENTS

A. The following publications form a part of this Specification and where referred to by basic designation only, are applicable to the extent indicated. Reference is to the latest edition of each unless specified otherwise.

1. American Society for Testing and Materials (ASTM):

- a. C-478 Precast Reinforced Concrete Manhole Sections.
- b. D-3034 Type PSM PVC Sewer Pipe and Fittings.
- c. D-3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- d. D-2321 Underground Installation of Flexible Thermoplastic Sewer Pipe.
- e. F-477 Elastomeric Seals for Joining Plastic Pipe.

2. American Water Works Association (AWWA):

- a. C-151 Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds.
- b. C-111 Joints for Ductile Iron Pipe, Rubber Gasket.
- c. C-110 Gray Iron and Ductile Iron Fittings.
- B. Local Building Codes: City, County, States or Federal Codes applying to the work.
- C. Miss. Standard Specifications for Road and Bridge Construction, 1990 edition (MDOT): Sections as referenced herein.
- 1-05 SUBMITTALS: The Contractor shall submit testing reports, manufacturer's certifications, shop drawings, manufacturer's catalogs, specification sheets and other incidentals, to the Contracting Officer, prior to ordering material.

PART 2 - MATERIALS

2-01 GENERAL

- A. The Contractor shall furnish materials necessary for or incidental to constructing a process piping wastewater system. Materials shall be new and of first quality with certified tests for pipe and pipe fittings made at the manufacturer's plant to assure conformance with these technical provisions. Three (3) certified copies of each test result shall be furnished to the Contracting Officer prior to installation.
- B. The kinds and classes of materials incorporated into the work shall be designated by the Contracting Officer. The Contractor shall not construe or interpret the several kinds of materials described herein as being equal in their application for the project.

2-02 WATER FOR CONSTRUCTION AND TESTING

- A. The Contractor shall be responsible for water needed in constructing the work, flushing the completed system, testing and other incidental needs. Water used shall be from an approved source relatively free of pollution and shall be of a satisfactory bacteriological quality.
- B. Water used in mixing concrete and mortar shall be fresh, clean and potable, suitable for drinking.

2-03 PIPE AND FITTINGS

- A. PVC Pipe and Fittings:
- 1. All PVC pipe greater than (12") inches in diameter for force mains shall conform to the latest edition of AWWA C-905 and shall be made from Class 12454-A or B materials per the latest edition of ASTM D-1784. Pipe shall be a minimum of DR 25 unless otherwise specified, for a working pressure rating of 165 PSI. All pipe shall conform with the outside diameter (OD) dimensions of ductile iron pipe to facilitate use of DIP fittings, standard cast iron valves and specials. All joints shall be elastomeric seals conforming to the latest edition of ASTM F-477. All pipe shall bear the seal of the National Sanitation Foundation (NSF). All jointing shall be made in accordance with the manufacturer's recommendations.
- 2. All PVC pipe 12" and less in diameter shall conform to the latest edition of AWWA C-900.
- 3. Pipe and fittings shall be tested for a minimum 150 PSI working pressure.
- 4. For PVC pipe 6" and larger all fittings shall be ductile iron with restrained joints.
- B. Ductile Iron Pipe:
 - 1. Ductile iron pipe shall be water pipe with push on rubber gasket joints manufactured in accordance with AWWA C-151. Ductile iron pipe and fittings shall be coated outside with a standard bituminous coating. **Pipe shall be lined inside in accordance with requirements of Technical Specification Section 02561**. Rubber gasket joints for slip joint ductile iron pipe shall conform to the requirements of AWWA C-111. Fittings shall conform to AWWA C-110. Jointing shall be completed in accordance with the manufacturer's specifications.

Ductile iron pipe installed pursuant to these specifications shall be encased with a minimum 8 mil thick loose polyethylene encasement, in accordance with the latest edition of ANSI/AWWA C-105.

MAXIMUM TRENCH DEPTHS FOR DUCTILE IRON PIPE

DIAMETER
OF PIPE

MAXIMUM TRENCH DEPTH (AT PIPE INVERT)
AWWA SPECIAL THICKNESS CLASS DESIGNATION

52

53

54

56

8"	20'	28'			
10"	16'	24'			
12"	16'	20'	28'		
16"	31'	37'	42'	48'	56'
18"	28'	32'	37'	42'	48'
20"	25'	28'	32'	37'	41'
24"	23'	26'	29'	32'	36'
30"	21'	23'	26'	29'	33'
36"	22'	24'	28'	31'	34'
42"	22'	25'	28'	31'	34'
48"	22'	25'	28'	32'	35'
54"	22'	25'	29'	32'	36'

DIAMETER MAXIMU AWW

MAXIMUM TRENCH DEPTH (AT PIPE INVERT) AWWA PRESSURE CLASS DESIGNATION

	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>
8"					25'
10"					19'
12"					20'
14"			16'	18'	20'
16"			16'	18'	21'
18"			15'	18'	20'
20"			15'	18'	20'
24"		14'	17'	19'	21'
30"	11'	14'	17'	18'	21'
36"	12'	15'	17'	20'	22'
42"	12'	15'	17'	20'	22'
48"	13'	16'	18'	21'	23'
54"	13'	16'	18'	21'	23'

Ductile iron pipe shall be at least AWWA Pressure Class 200 and shall be tested for a minimum 150 psi water working pressure. The pipe shall be based on the design conditions that: (1) earth loads for all pipe sizes are based on the prism load condition H-20, truck loads shall be included for all depths of cover; (2) the unit weight of the soil shall be one hundred twenty (120) pounds per cubic foot; and (3) the pipe shall be installed using Type 3 or Class "C" Bedding.

- 2. Joints for ductile cast iron pipe shall be slip-on type unless otherwise specified. Joints for fittings, valves and specials shall be mechanical joints, except where shown by the Drawings to be flanged. Slip-on pipe joint for ductile cast iron pipe shall conform to the latest edition of ANSI A 21.11 (AWWA C 111). Lubricants shall be non-toxic and shall be specifically manufactured for the pipe utilized. Mechanical joint pipes shall conform to the latest edition of ANSI A
- 3. Fittings shall be compact ductile or cast iron as specified on the Bid Form and shall conform to the latest edition of AWWA C-110 for cast iron and ductile iron fittings. The

minimum wall thickness of the fittings shall be determined consistent with trench conditions `B' and less than five (5) feet cover. Fittings shall be tar coated outside in accordance with the latest edition of AWWA C-104 (ANSI 21.4). Fittings shall be lined inside in accordance with requirements of Technical Specification Section 02561 contained herein.

4. All influent Process Piping and fittings up to the Aeration Basin shall be furnished with lining in accordance with Section 02561 contained herein. All piping from the Aeration Basin to the effluent structure shall be cement lined.

C. Fiberglass Pipe

- 1. Pipe material for Option #1 gravity sewer may be either ductile iron or fiberglass pressure pipe manufactured with extra corrosion resistant glass fibers. The fiberglass pipe shall meet AWWA C950-01 and ASTM D 3517-01 with a 72 psi stiffness.
- 2-04 MARKING SEWER PIPE: Each pipe or fitting shall have plainly and permanently marked thereon: (1) pipe class; (2) date of manufacture; and (3) manufacturer's name or trademark. Marking shall be neatly stamped in the pipe or painted thereon with waterproof paint.

2-05 LINING FOR PIPE, MANHOLES AND WETWELLS

A. Pipe Lining

- 1. General: Interior and joint surfaces of each ductile iron and concrete pipe section, fittings and specials shall be lined inside in accordance with requirements of Technical Specification Section 02561. Before lining/coating work is commenced, the Contractor shall submit to the Contracting Officer the proposed lining/coating suppliers complete materials data sheets and application specifications prepared for the particular application.
- 2. Surface preparation, materials used, application of materials, curing and all other procedures shall be in full compliance with the lining/coating suppliers specifications and Section 02561. The Contractor shall furnish an affidavit from the lining/coating supplier that each pipe length, fitting or special has been lined/coated in accordance with Specification Section 02561 prior to installation.

B. Manhole and Wetwell Lining

1. Sanitary Sewer system manholes and pump station wetwells shall be lined outside with a polyamide coal tar epoxy, similar or equal to MO-TAR C-200 by Mobile Paints. Interior lining shall meet the requirements of Section 02562 contained herein.

2-06 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall be responsible for the condition of excavations made by him. Slides and cave ins shall be removed without extra compensation, at whatever time and under

- whatever circumstances that may occur. The Contractor is solely responsible for maintaining safe working conditions.
- B. Installation of sheeting, shoring and bracing shall be the responsibility of the Contractor. Shoring left in place shall not entitle the Contractor to claims for extra compensation unless so indicated on the Bid Form as a separate pay item.

2-07 INCIDENTAL MATERIALS

- A. Masonry brick: Shall conform to the standard specifications for sewer brick, made from clay or shale, ASTM C-32, Grade MS.
- B. Mortar: Portland Cement Mortar shall consist of one (1) part Portland Cement complying with ASTM C-150, Type 1, and three (3) parts mortar sand and sufficient water to mix mortar to proper consistency.
- C. Gray Iron Castings: Shall conform to the standard specifications for gray iron castings ASTM A-48, Class 25.
- D. Manhole Steps: Steps for manholes shall be cast aluminum alloy meeting (Alloy AA-514) and Federal Specification G4A, or corrosion resistant plastic encased steel.
- E. Foundations: Shall be either precast units or poured in place reinforced concrete as detailed, set on undisturbed earth or select bedding, where required by the Contracting Officer or detailed on the Drawings. Concrete shall be Class "B" 3,000 PSI as specified in Section 03300 "Cast in Place Concrete".
- F. Precast Manhole Sections: Manholes constructed with precast units shall comply with ASTM C-478 and joints shall be preformed plastic joints. Preformed plastic joint compound shall meet Federal Specification SS-S-00219.
- G. Bituminous Waterproofing: Shall be applied to the exterior of all pipe and to concrete structures up to the ground line.
- H. Marking Tape: Shall be detectable underground marker tape, 2" wide, with "CAUTION SEWER" printed continuously along its length. Shall be green with silver-colored trim and lettering, or other color combination acceptable to the Owner.
- I. Sealed Manhole Lids: Shall be watertight manhole frames with bolted lids, round neoprene gaskets.
- J. Manhole Connections: Manhole connections shall be made using a neoprene boot meeting ASTM Specification C-443. Internal and external band shall be stainless steel meeting ASTM Specification A-167.
- 2-08 MATERIALS FOR SUPPLEMENTARY WORK: Materials for supplementary work consisting of repairs and replacement of street paving, sidewalks, driveways, parking areas, clay gravel areas, curbs, lawns, grass plots and other related items shall conform to the respective Sections of these Specifications, or as specified on the Drawings.

2-09 BEDDING AND BACKFILL

- A. The pipe shall be installed in accordance with the requirements specified in Part 3, hereafter. Native material excavated from the trench may be used for backfill, where allowed by the Contracting Officer from one foot above the top of pipe to the top of the trench. Such native material shall be non-organic, debris-free soil. Material required for select bedding and backfill is specified in paragraphs B and C hereafter.
- B. <u>Select Bedding and Backfill</u>: Select bedding and backfill material shall be considered as material hauled in from off site. Material used in meeting this specification shall not be measured or paid for separately but shall be considered an absorbed cost item relative to the cost of pipe installation. Testing costs incurred for tests required to verify that material meets this Specification shall be borne by the Contractor.
 - 1. Select Bedding: Select granular material for bedding all pipe shall be a mixture of coarse concrete aggregate and coarse river-run sand. The mixture shall consist of two (2) parts coarse concrete aggregate conforming with ASTM Standard Specification C-33 to one (1) part coarse sand. The bedding material shall be thoroughly blended by the Contractor to produce a well-graded uniform mixture prior to placement in the trench. Prior to blending, the coarse concrete aggregate shall conform with the gradation sizing Number 467 specified in Table 2 of ASTM Standard Specification C-33 as follows:

GRADING REQUIREMENTS FOR COARSE AGGREGATE (ASTM C-33. TABLE 2, SIZE 467)

	PERCENT
SIEVE SIZE	PASSING BY WEIGHT
2 Inch	100
1-1/2 Inch	95/100
3/4 Inch	35/70
3/8 Inch	10/30
Number 4	0/5

The grading limits for fine aggregate shall be as follows:

	PERCENT
SIEVE SIZE	PASSING BY WEIGHT
3/8 Inch	100
Number 4	95/100
Number 8	80/100
Number 16	50/90
Number 30	30/70
Number 50	3/30
Number 100	0/5

2. Select Backfill: Select material for backfilling pipe trenches shall be select sandclay material meeting the following gradation limits.

PERCENTAGE (BY WEIGHT) SIEVE SIZE PASSING SQUARE MESH SIEVES

No. 10 30/100

The material passing the No. 10 sieve shall meet the following:

No. 10	100
No. 40	20/85
No. 60	15/70
No. 200	8/40

The material passing the No. 40 sieve shall meet the following:

Liquid Limit 25 Max.

Plasticity Index (P.I.) NP to 6 Max.

2-10 DUCTILE IRON FLANGED PIPE AND FITTINGS

- A. Ductile iron pipe shall conform to AWWA C115 and C110 standards. Flanged pipe shall be Class 53 as per AWWA C150. All pipe and fittings shall be lined in accordance with Section 02561 contained herein.
- B. Flange joints shall be flat face type meeting ANSI B 16.1 Class 125 requirements. Flange gaskets shall be full face type per AWWA C111 to provide positive sealing for the flange joints. Thickness shall be 1/8 inch unless otherwise indicated. Assembly bolts shall be square headed carbon steel machine bolts with hexagon nuts per ANSI B 18.2. Thread shall conform to ANSI B 1.1. Bolt length shall be such that after joints are assembled, the bolts shall protrude through the nuts, but not more than ½ inch.

2-11 VALVES

- A. Gate valves shall comply with the latest edition of AWWA C-509. Gate valves shall be iron body, encapsulated high strength cast iron wedge, resilient seat, non-rising stem, and shall open counterclockwise. All gate valves shall have a maximum working pressure of 200 PSI and be tested at 400 PSI. The thrust collar and other bearing surfaces shall be permanently lubricated with oil. Gate valves shall be equipped with mechanical joint connections unless otherwise specified.
- B. Plug valves shall be of the non-lubricated, eccentric type and shall be designed for a working pressure of 175 psi for valves 12" and smaller, 150 psi for valves 14" and larger. Valves 20" and smaller shall be round port design. Valves shall provide tight shut-off at rated pressure. All plug valves shall be from the same manufacturer.

The plug valve body shall be cast iron ASTM A126, Class B with a welded-in overlay of 90% nickel alloy content on all surfaces contacting the face of the plug. Sprayed, plated, nickel welded rings or seats screwed into the body are not acceptable. The valve plug shall be cast iron ASTM A126, Class B with Buna-N resilient seating surface to mate

with the body seat. Plug valves shall be furnished with permanently lubricated, sleeve type metallic bearings. Grit excluder seals shall be provided in the upper and lower journals to isolate the bearings. Plug valve shaft seals shall be the self-adjusting type, replaceable without removing the valve bonnet.

Valve Actuators: Manual gear actuators shall be totally enclosed worm and gear type permanently lubricated. Buried valves 6" to 10" shall be provided with gear actuators. Valves 24" and larger shall be equipped with valve position indicators. All buried plug valves shall be mechanical joint.

- C. Check valves in the pump station, shall be resilient seated, AWWA approved, 150 psi working pressure, with outside lever and weight for exposed installation with connections as indicated on the Drawings.
- D. Butterfly valves and actuators shall conform to the applicable requirements of AWWA standard C504 latest revision for rubber seated butterfly valves and to the requirements stated herein. Valves shall be rated for 250 PSI operating pressure.

PART 3 - EXECUTION

3-01 SITE PREPARATION

- A. The Contractor shall prepare, on a timely basis, rights-of-way, easements and sites indicated on the Drawings for construction of the wastewater improvements. The work shall include clearing and grubbing, removal of structures and obstructions, and the removal of permanent surfaces and landscaping items designated to be restored upon completion of the installation.
- C. Clearing and grubbing shall conform to the requirements specified elsewhere herein and shall include the removal of trees, roots, vegetation, structures and obstructions unless separate pay items are specifically provided for on the Bid Form. The completion of clearing and grubbing shall leave the site clear and free from undesirable obstructions, ready for trench excavation.

3-02 GENERAL

A. Install force mains where shown on Drawings, in compliance with manufacturer's instructions. PVC pipe shall be installed in accordance with ASTM D-2321. Ductile iron pipe shall be installed in accordance with AWWA C-151. Unless otherwise specified by the Contracting Officer, PVC pipe shall be installed on a prepared trench bottom using Class IV native materials or better for select backfill and bedding, and DIP shall be installed on flat-bottom trench, Type 2 bedding, using native materials.

3-03 COVER

A. COVER: Maintain forty two inches (42") minimum bury along process piping unless otherwise shown on Drawings or directed by the Contracting Officer.

3-04 EXCAVATION AND TRENCHING

- A. Excavation of every description and of whatever substances encountered shall be performed to the depths indicated on the Drawings or as otherwise specified. Excavation shall be done by open cut from the surface except when tunneling or boring is specified or directed in writing by the Contracting Officer. Trench width shall be kept as narrow as practical to provide a safe working area and to minimize excavation, and shall be maintained in strict compliance with OSHA regulations.
- B. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave ins. Excavated materials not required or not suitable for backfill shall be removed and wasted as directed by the Contracting Officer. Grading shall be done, as necessary, to prevent surface water from flowing into trenches or other excavations. Water accumulating therein shall be removed by pumping or by other approved methods. Temporary sheeting and shoring shall be used where necessary for the protection of the work and for the safety of the personnel.
- C. During excavation, materials meeting select bedding and/or backfill requirements shall be either separately or selectively stockpiled for use as pipe bedding and pipe backfill material. Sand material shall be handled and stockpiled in such a matter to prevent mixing with clay material when rehandled for backfilling.
- D. Excavation for manholes shall be sufficient to permit the carrying out of the construction as required.
- E. Trenches for process piping and other appurtenances shall be of only such width as necessary for proper laying of the pipe. The net width of the trench at and below the top of the pipe shall be at least the pipe O.D. plus twelve inches but not more than the pipe O.D. plus twenty four inches. The width of the trench above this level may be as wide as necessary for sheeting, bracing, shoring or **for proper safe performance of the work.**
- F. The sides of the trench shall be maintained in strict compliance with OSHA regulations.
- G. The bottom of the trench shall be carefully graded, formed and aligned according to these Specifications and reviewed by the Contracting Officer's observer before piping is laid thereon. The bottom of the trench shall be hollowed under each pipe joint to conform to the shape of the pipe, and holes shall be cut for the bells, allowing the body of the pipe a uniform contact and support throughout its entire length.
- H. The Contractor shall leave a minimum 2 foot berm width on each side of the trench between the trench and the excavated earth, to allow the free passage of workmen, the Contracting Officer's representative and to permit work in a safe, expeditious and satisfactory manner.
- I. No more than three hundred (300) feet of trench shall be opened in advance of the completed sewer, nor shall more than one hundred (100) feet be left unfilled except by permission from the Contracting Officer. In special cases, the Contracting Officer, when so requested by the Contractor, may waive the distance restriction to which the trench may be opened by notifying the Contractor in writing.

3-05 TUNNELING OR BORING: Tunneling will be permitted only where indicated on the Drawings or by special permission of the Contracting Officer.

3-06 SHEETING, SHORING AND BRACING

- A. Sheeting, shoring, and bracing shall be furnished, placed and maintained by the Contractor as may be required to support the sides of the excavation. The Contractor shall be fully responsible for the sufficiency of such supports to prevent movement which can injure or delay the work or endanger or cause damage to adjacent pavements, buildings or other structures, channels and drainage structures, or create undue hazards to workmen. Where in the opinion of the Contracting Officer, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place. The material and installation requirements for sheeting, shoring and bracing shall be in accordance with applicable sections of the Mississippi Standard Specifications for Road and Bridge Construction, 1990 Edition.
- B. Sheeting, shoring and bracing which are not ordered by the Contracting Officer to be left in place shall be removed in such manner as not to endanger the constructed sewer or other structures, utilities or property. Voids left or caused by the withdrawal of sheeting shall be immediately refilled with sand by tamping with tools specifically adapted to the purpose, by watering, or otherwise as may be directed.

3-07 EXCAVATED MATERIAL

- A. Excavated material from trench and structure excavation suitable for backfill shall be placed compactly on the sides of the excavation and kept up so as not to endanger the work and be of as little inconvenience as possible to the public travel and abutting property, and so that free access is maintained to fire hydrants and water valves in the vicinity of the work. Material encountered in the excavation which, in the opinion of the Contracting Officer, is not suitable for use in the work, shall be removed and wasted as directed and shall not be stockpiled along the side of the excavation.
- B. The disposal of surplus and unsuitable excavation shall be the responsibility of the Contractor at his own expense. Surplus and unsuitable material not to be used in the construction of the project shall not be left on the right-of-way or easement of the project, nor adjacent thereto, except by written permission of the affected property owner.
- 3-08 DEWATERING: The Contractor shall be solely responsible for implementation of adequate dewatering provisions, as described hereafter. A copy of the geotechnical investigation report associated with this project is included as the last section of these specifications.
- A. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of surface and ground water entering excavations, trenches or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed therein is complete to the extent that no damage from hydrostatic pressure, flotation or other cause will result.

The normal water table shall be restored to its natural level in such a manner as not to disturb the pipe and its foundation.

- B. Excavations for concrete structures or trenches which extend down to or below static ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations eighteen inches (18") or more below the bottom of the excavation; except where the pipe is laid in an impervious strata, the lower trench section shall be maintained in a dry condition for bedding. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench.
- C. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.
- D. The Contractor will be held responsible for the carrying capacity of pipe or conduit which he may use for drainage purposes. Pipes or conduits shall be kept clean and free of sediment or other restrictions.
- E. No separate payment will be made for this item.

3-09 STEEL SHEET PILING

- A. Unless required by the drawings, steel sheet piling shall be driven at locations to be determined by the Contractor as necessary for protection of buildings, structures, utilities, channels or to prevent hazards to workmen. Piling may be new or used and shall be in such condition that it can be interlocked and driven satisfactorily.
- B. The Contractor shall be responsible for adequately bracing the units against lateral forces. Piling shall be driven before final adjacent excavations are made.
- C. Pile driving equipment used shall be maintained in first class condition and shall operate efficiently in the space provided. Equipment shall be subject to the review of the Contracting Officer.
- D. The material and installation requirements for sheet piling shall be in accordance with applicable sections of the Mississippi Standard Specifications for Road and Bridge Construction, 1990 Edition.
- E. No separate payment will be made for this item unless so indicated on the Bid Form as a separate pay item.

3-10 PIPE PLACEMENT

A. General: Unless otherwise noted on the Drawings or directed by the Contracting Officer, the bed for the pipe shall be so shaped that at least the lower quarter of the pipe shall be in continuous contact with the bottom of the trench.

- 1. When bell and spigot pipes or pipe couplings are used, spaces shall be cut to accommodate the bells or couplings. These spaces shall be deep enough to ensure that the bells or couplings do not bear the load of the pipes. When the pipes are laid, the barrel of each section of pipe shall be in contact with the quadrant shaped bedding throughout its full length, exclusive of the bell or coupling, to support the entire load of the pipe. Adjustments to line and grade shall be made by scraping away or filling in and compacting the earth under the body of the pipe and not by wedging or blocking up the pipe. Pipe shall not be laid on frozen ground.
- 2. Before pipe is laid in the trench, the section in which pipe is to be placed must be dry and must be kept dry while joints are completed. Pipes, prior to being lowered into the trench, shall be thoroughly inspected by the Contractor's forces so that when jointed in the trench, there shall not be shoulders or unevenness along the lower half of the pipe. The faces of spigot ends and shoulders in the hubs or sockets shall be true. Abnormal enlargements on these faces shall be cut away before the pipe is lowered into the trench.
- 3. The pipe shall be laid upstream, without breaks and with the bell end upgrade. Whenever the work ceases for any reason, the unfinished end of the pipe line shall be securely closed with a tight-fitted plug or cover. Pipe shall be so placed and maintained, that at the time of final acceptance of the project, the completed lines will be true to the established alignment and flow line grades.
- 4. Construction shall begin at the lowest point, or elevation, and the pipe shall be laid continuously upstream without omitting sections or reaches.
- B. The installation and joining of pipe shall be in strict accordance with the applicable ASTM or AWWA Standards and the pipe manufacturer's recommendations.
- C. The trench subgrade shall consist of firm, stable, non-organic, debris-free soil. In locations where trench excavation exposes unsuitable material, as classified by these specifications, or in the judgement of the Contracting Officer, the subgrade shall be undercut as directed by Contracting Officer for the full design width of the trench and backfilled with select bedding material meeting the requirements of Part 2-09, herein, and installed in accordance with the requirements of Part 3-12 hereafter. Such undercutting and select bedding material will be compensated in accordance with the requirement of Part 4, hereafter. Select bedding material in the pipe envelope will not be considered for payment.
- 3-11 PIPE BEDDING: The pipe shall be placed on compacted select bedding material shaped and placed on the trench bottom. The bedding material shall meet the requirements of Part 2-09 herein.

3-12 ALIGNMENT

A. The Contractor shall utilize a commercial grade laser beam specifically manufactured to aid in maintaining grade and alignment of pipelines during installation. The primary unit shall be mounted on a heavy duty base and firmly anchored in the downstream manhole

- of the reach under construction. The maximum distance shall not exceed four hundred feet (400') per set up unless otherwise approved by the Contracting Officer.
- B. Each joint of pipe will be installed using an approved target to align the pipe with the projected laser beam. The methods and procedures shall be in strict accord with the manufacturer's recommendations and instructions. Proper ventilation shall be maintained at all times. Care shall be exercised in order to prevent bumping or misalignment of the projected beam.

3-13 MANHOLE CONSTRUCTION

- A. General: Manholes shall be constructed of precast concrete sections, unless otherwise specified.
- B. The construction shall also include the necessary frames, covers, castings, fittings, steps, inverts, plugs and connections; installed or constructed in accordance with these Specifications and conforming to all requirements, details, lines, grades and dimensions shown on the Drawings or established by the Contracting Officer.
- C. Manholes and other structures shall receive two (2) coats bituminous water proofing on the exterior surface to the ground line, and interior lining in accordance with the requirements of Paragraph 2-05, B contained elsewhere herein.

3-14 PIPE CONNECTIONS TO MANHOLES

- A. General: When the Plans indicate connections to existing manholes, these connections shall be watertight and all work performed in an acceptable manner.
- B. The size of the opening cut in the manhole wall shall be restricted to a nominal diameter sufficient only to insert the sewer pipe. The pipe shall be inserted into the manhole with a sealed watertight flexible rubber-boot type of connection to prevent water or waste leakage. Straps and connectors shall be stainless steel.
- 3-15 BACKFILLING: Backfill shall consist of the material placed as indicated on the detail shown in the construction drawings. As pipe is laid and suitably bedded in accordance with Part 3-12 herein, trenches and excavation shall be promptly backfilled to a level one-foot above the top of the pipe in relatively thin lifts with select backfill material defined in Part 2-09 and compacted to a minimum 90% standard Proctor maximum dry density (ASTM D 698). Backfill shall be placed and tamped equally and thoroughly along each side of the pipe in a manner to avoid displacement of or damage to the pipe.
- A. Tamping: The backfill shall be placed in equal thickness lifts, each lift being thoroughly compacted to the density specified. Each lift of the backfill material shall have proper moisture content to permit compaction to this density.
 - 1. In areas where street paving, sidewalks, driveways and other restoration work is required, the backfill above the one (1) foot cover level shall be compacted to the subgrade level or as directed and maintained to eliminate voids and future

- settlement. Special compaction procedures involving 95% density on 6" lifts are required at such locations and at other locations shown on the Drawings.
- 2. In open fields or undeveloped areas, the backfill above the one (1) foot cover level may be placed in twelve inch (12") layers and compacted to a density of not less than that of the surrounding earth. The top of the filled trench shall be mounded slightly above the natural ground to allow for settlement.
- 3. Landscape and cultivatable areas shall be restored by the replacement of the stockpiled topsoil stripping to a depth of at least twelve inches (12").
- B. Jetting: This method of backfill shall not be used.
- C. Marking: Marking tape shall be provided and installed above the sewer pipe within 12 to 18 inches from the final grade.
- 3-16 MAINTENANCE OF SITE: The Contractor shall prevent, control and correct dust nuisance or muddy conditions developing on roadways as a result of his operation. No payment for maintenance of the site shall be made but shall be considered as a subsidiary obligation of the Contractor.

3-17 TESTS

A. General: Before any backfill is placed, the piping shall be checked by the Contracting Officer for line, grade and workmanship. Before acceptance, each section of the line between manholes, structures, valves or such other length as determined by the Contracting Officer to be suitable, shall be thoroughly inspected and any defects in workmanship identified shall be immediately corrected. Sections that can be tested hydrostatically, shall be. All other sections shall be otherwise tested as determined by the Contracting Officer.

B. HYDROSTATIC TEST:

- A. After the pipe is laid and the line flushed, it shall be filled with water, with care being exercised to expel all air from the pipe. During the test period pipe, valves, fittings, and joints shall be examined carefully for defects. Observed leaks or defective pipe shall be satisfactorily repaired or replaced, at the expense of the Contractor, and the test repeated until the section tested is within the limits specified. The entire system or parts thereof shall be tested under hydrostatic pressure of 150 psi, for a period of 4 hours, if covered. Repairs shall be made using approved materials and new replacement fittings, specials, or gaskets where leakages occur.
- B. Leakage shall be measured by an approved calibrated meter through which the water required to maintain test pressure shall be pumped. Testing shall be performed in the presence of the Contracting Officer, or his authorized representative and the Contracting Officer shall be notified at least 24 hours in advance of the start of the test.
- C. Contractor shall furnish the pump, pipe connections, fittings, gates, meters, and necessary apparatus and shall furnish all labor and work required to make the tests. Costs of testing

shall be borne by the Contractor and testing operations shall The remain in operation until approved by the Contracting Officer. Allowable leakage shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe, at the specified test pressure.

D. AIR TESTING

- 1. In lieu of the exfiltration test specified above, the Contractor may at his option, complete an air test in accordance with the following specifications. The air test shall in no case replace the infiltration test where ground water is present.
- 2. Procedure: The sewer line to be tested shall be tested between manholes. The line shall be sealed at both ends. The seal at one end shall have an orifice through which to pass air into the pipe. An air supply shall be connected to the orifice at one end of the line. The air supply line will contain an on off gas valve and a pressure gauge having a range of 0 to 15 psi. The gauge shall have minimum divisions of .10 psi and shall have an accuracy of +.04 psi. Pressuring equipment should include a regulator or relief valve to avoid overpressuring and damaging an otherwise acceptable line.
- 3. The pipe line under test shall be pressurized to 4 PSIG. The line will be allowed to stabilize between 4 PSIG and 3.5 PSIG for a period of no less than 5 minutes. If necessary, air should be added to the line to maintain the pressure above 3.5 PSIG. After stabilization period, the gas valve shall be closed. When the line pressure drops to 3.5 PSIG, commence timing with a stop watch. The stop watch should be allowed to run until such time as line pressure drops to 2.5 PSIG. Then the watch should be stopped and time lapse compared with the allowable time lapse in <u>Table 1</u> at the end of this Section, and for pipe size and leakage allowance specified by the Contracting Officer. If the time lapse is greater than that specified, the section undergoing testing shall have passed, and the test may be discontinued at that time. If the time is less than that specified, the line has not passed the test and the Contractor will be required to find the leaks, repair them and retest until the section passes, at his own expense.

3-18 FLUSHING

- A. The completed gravity flow system shall be free of mud, siltation and other foreign matter deposited or collected during construction. Flushing shall commence at the upstream end of the completed system and continue downstream manhole to manhole. Only water from an approved source will be permitted.
- B. Water used in flushing will not be permitted to enter into the existing system but shall be disposed of in a manner acceptable to the Contracting Officer.
- D. Flushing shall be accomplished prior to testing should the collected matter be sufficient in quantity to obstruct or affect the testing. Flushing will not be required in those sectors of the installed pipes and manholes where the exfiltration test has adequately cleaned the mains.

3-19 CLEAN-UP

- A. After the backfill is completed, the Contractor shall dispose of surplus material, dirt and rubbish from the site. Surplus dirt shall be disposed of in Contractor furnished and approved disposal areas or in on site areas as directed by the Contracting Officer.
- B. After work is completed, the Contractor shall remove tools and other equipment used by him, leaving the entire site free, clear and in clean condition.

Table 1

TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP TO 2.5 LAMENTS (Based on 0.003 cfm per sq. ft. and 2.0 cfm)

Length												
of test												
section												
in ft.					Pipe	Diame	ter in I	nches				
	<u>4</u> 4	<u>6</u>	<u>8</u> 22	<u>10</u>	12 93	<u>15</u>	<u>18</u>	<u>21</u>	<u>24</u>	<u>27</u>	<u>30</u>	<u>36</u>
25	4	16	22	28	93	62	89	121	158	200	248	356
50	10	33	43	55	158	124	178	243	317	401	495	713
75	19	49	66	83	240	186	267	364	475	601	743	1020
100	30	66	87	95	305	248	375	525	639	765	851	
125	41	82	109	110	349	372	510	650	680			
150	60	98	131	132	381	455	610					
175	79	115	153	154	413	575						
200	86	131	174	176	436							
225	95	147	196	294	459							
250	109	164	218	338								
275	113	189	240	382								
300	122	197	262									
350	131	213	306									
400	139	230	306									
450	147	246	306									
500	156	246	306									
550	165	246	306									
600	174	246	306									
650	183	246	306	382	459	575	610	650	680	765	851	1020

DIVISION 2 – SITEWORK

SECTION 02561

INTERIOR COATING FOR CONCRETE AND DUCTILE IRON SANITARY SEWER TABLE OF CONTENTS

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PART 1 – GENERAL

SECTION 02561

INTERIOR COATINGS FOR CONCRETE AND DUCTILE IRON SANITARY SEWER PIPE

PART 1 - GENERAL

1-01 DESCRIPTION

Concrete and ductile iron pipe and fittings shall have a ceramic epoxy lining on the interior and a bituminous coating on the exterior except for 6 inches back from the spigot end. The bituminous coating shall not be applied to the first 6 inches of the exterior of the spigot ends. Ductile pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron pipe and fittings shall be as cast without ever having been lined prior to the application of the specified lining. Ductile iron sewer pipe or fittings furnished for this project must not have been lined prior to the awarding of the contract for this project.

PART 2 - MATERIAL

2-01 Brand name(s) items in this sub-section are used to set a standard of quality. It is not intended to restrict the Contractor from offering an equal item from another source(s) of supply.

2-02 LINING MATERIAL

The material used for the lining shall be a 2-component amine cured epoxy of at least 87% solids. Protecto 401 by Vulcan Painters, Birmingham, Alabama; or Permite 9043, Type II glass-filled epoxy by Permite Corporation, Atlanta, Georgia, are the standard of quality. Any products submitted must be accompanied by certified test data reflecting the ability of the material to perform per these Specifications. The following are the minimum requirements to be met:

- A. A permeability rating of zero permeance when a film of at least 40 mils is tested according to ASTM D 1663-72 (reapproved 1979) or a permeability rating of 0.0 perms when measured using Method A of ASTM E96-66, procedure A with a test duration of 42 days.
- B. The material shall contain at least 20% by volume of ceramic quartz pigment in the dried film.
- C. The following test must be run on ductile iron panels with the results certified by the lining material supplier of the material being submitted.

TEST

RATING/METHOD

1. Direct Impact

ASTM D-2794

TEST RATING/METHOD

2. 3% Sulfuric Acid ASTM D-714-56 (1974) Immersion at 120°F

3. 25% Sodium Hydroxide ASTM D-714-56 (1974) Immersion at 140°F

4. Deionized Water ASTM D-714-56 (1974) Immersion at 160°F

5. Moisture and Ultraviolet Light ASTM G5377
Cycle 8 hours light/4 hours 100% humidity

2-03 SUBMITTALS

Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures

PART 3 - EXECUTION

3-01 APPLICATION

A. Applicator

The lining shall be applied by a competent firm with at least a 5-year history of applying linings to the interior of concrete and ductile pipe and fittings.

B. Surface Preparation

Prior to abrasive blasting, the entire area which will receive the protective compound shall be inspected for oil, grease, etc. Areas where oil, grease or other substances which can be removed by solvent is present shall be solvent cleaned using the guidelines outlined in SSPC-1 solvent cleaning. After the surface has been made free of grease, oil or other substances, areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media. The blast media shall strike the surface at a minimum angle of 45. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc. are removed from the surface. Only slight stains and specks of tightly adhering oxides may be left on the surface. Areas where rust reappears before coating must be reblasted to remove rust.

C. Lining

After the surface preparation and within 8 hours of surface preparation, the barrel of the pipe from the inside shoulder of the gasket groove to the end of the interior spigot shall receive minimum coating of 24 mils dry film thickness of the protective lining. If flange fittings of pipe are included in the project, the linings must not be used on the face of the

flange; however, full face gaskets must be used to protect the ends of the pipe. Fittings shall be lined with a minimum of 24 mils of the protective lining. Push-on type fittings shall be lined from the gasket groove to the gasket groove. The 24 mils system shall not be applied in the gasket grooves.

D. Coating of Gasket and Spigot Ends

Due to the tolerances involved, the gasket groove and spigot end up to 6 inches back from the end of the spigot end must be coated with a minimum of 10 mils dry of protective coating. This coating shall be applied by brush to ensure coverage. Care should be taken that the coating is smooth without excess buildup in the gasket groove or on the spigot end. Materials for the gasket groove and spigot end shall be applied after the application of the lining.

E. Number of Coats

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied in excess of the dry thickness per coat recommended by the lining manufacturer in printed literature. The time between coats shall never exceed that time recommended by the lining material manufacturer. No material shall be used for lining which cannot be recoated with itself without roughening of the surface after 4 hours cure @ 100°F. If the lining must be recoated beyond the lining material manufacturer's recommended recoat time, the surface of the existing lining shall be roughened sufficiently to prevent delamination between coats.

2 CONCRETE PIPE

After the pipe has cured, the equivalent of seven days at 77°F, the interior of the pipe exposed to liquids and gases shall be blasted and cleaned to remove all loose laitance, form oils or other loose material. After cleaning, the lining material shall be applied to yield 24 mils for the complete system using a centrifugal lance applicator. No lining shall take place over grease, oil, etc. that would be detrimental to the adhesion of the compound to the substrate. The compound shall not be applied when the substrate temperature is below 40°F or in adverse atmosphere conditions which will cause detrimental blistering, pinholing, or porosity of the film. In no case, shall the lining be applied when the concrete surface is above 14% moisture content. Due to tolerances, the joint areas must be coated with a minimum of 10 mils dry of protective coating. Dry film thickness shall be measured by application Specification No. 2 (SSPC-PA2 November 01, 1982).

3-03 INSPECTION AND CERTIFICATION

A. INSPECTION

1. Ductile iron pipe shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 film thickness rating.

- 2. Concrete pipe shall be checked for thickness using a magnetic film thickness gauge on metal coupons attached to 5% of the pipe coated.
- 3. The barrel of all pipe and fittings shall be pinhole-detected with a non-destructive 2,500 volt pinhole test.
- 4. Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on that date.

B. CERTIFICATION

The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified, and that the material was applied as required by the specification.

3-04 FIELD APPLICATION

A. SURFACE PREPARATION

- 1. The damaged or abraded area shall be brushed vigorously with a wire brush or sanded with coarse sandpaper to remove all loose material. After the surface has been cleaned, care should be taken to remove all dust from the cleaning operation. This can be accomplished by blowing off with compressed air or by brushing with a dry brush.
- 2. Lining material shall be mixed thoroughly in strict accordance with manufacturer's recommendations. After the material has been thoroughly mixed, apply to the prepared surface by either brush, roller or airless spray. The material will be applied in one or two coats, as directed by the Contracting Officer, depending on the size of the damaged area and whether it goes to the substrate or not.

DIVISION 2 - SITEWORK

SECTION 02562

MONOLITHIC MANHOLE SURFACING SYSTEM

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SECTION 02562

MONOLITHIC MANHOLE SURFACING SYSTEM

PART 1 - GENERAL

1-01 Description

- A. This specification covers work, materials, equipment and tools including specially developed application equipment as required for installation and testing of the field applied monolithic manhole surfacing system. All manholes in the Industrial Waste system shall be treated with this system after installation is complete.
- B. The use of specialized application equipment combined with rigorous surface preparation requirements shall be used to apply the monolithic manhole surfacing system without the use of solvents. The equipment adds high heat and pressure to the monolithic surfacing system resulting in a high build and quick set of the completed system.
- C. Product application requirements and procedures described include surface preparation, mixing, application, material handling and storage, qualification of applicator, and application quality control.
- D. In order to be considered as an equal a product will have the minimum characteristics as measured by the applicable ASTM standards as specified in this section.
- E. Equal products must be approved a minimum of eight calendar days prior to bid date and the contractor must have completed an equivalent of 500, 48" diameter manholes with the use of 100% solids epoxy 0-6ft in depth.

1-02 Quality Assurance

- A. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM and NACE standards together with monolithic surfacing system manufacturer and the Contracting Officer's recommendations.
- B. Applicator shall use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts. These workmen shall be completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Applicator shall use approved specialty equipment adequate in size, capacity and number sufficient to accomplish the work of this Section in a timely manner.
- D. Product shall be manufactured at a facility that is certified as meeting ISO-9002 quality management standards.

1-03 Reference Standards:

A. ASTM D638	Tensile Properties of Plastics
B. ASTM D790	Flexural Properties of Unreinforced and Reinforced Plastics
C. ASTM D695	Compressive Properties of Rigid Plastics
D. ASTM D4541	Pull-off Strength of Coatings Using a Portable Adhesion
	Tester
E. ASTM D2584	Volatile Matter Content
F. ASTM D2240	Durometer Hardness, Type D
G. ASTM D543	Water Vapor Transmission of Organic Coating Films
H. ASTM D543	Resistance of Plastics to Chemical Reagents
I. ASTM C297	Flatwise Tensile Strength of Sandwich Constructions
J. ASTM	The published standards of the American Society for Testing
	and Materials, West Conshohocken, PA
K. NACE	The published standards of National Association of
	Corrosion Contracting Officers (NACE International),
	Houston, TX

1-04 Submittals

- A. Shop Drawings: Submit data on monolithic surfacing system and application procedures.
 - 1) Qualification and Performance Responsibility of Applicator:
 - (a) The Applicator shall apply the system and be responsible for the complete performance of the system, including materials, application, and quality control. Applicator shall provide documentation that applicator is an approved installer and licensed by the monolithic surfacing manufacturer and specialized equipment supplier.
- 1-05 Delivery, Storage, and Handling
 - A. Materials are to be kept dry, protected from weather, stored under cover and stored between 50° F and 100° F. Do not store near flame, heat, or strong oxidants. Protective coating materials are to be handled according to their material safety data sheets.

PART 2 - PRODUCTS AND APPLICATION EQUIPMENT

2-01 Existing Products

A. Quick setting high strength concrete with latex or curing agent additives can not be used unless successfully tested with the coating for compatibility or approved for use by the protective coating and concrete manufacturer. Proper surface preparation procedures must be followed to ensure adequate bond strength to any surface to be coated. New cement or concrete must cure at least 28 days prior to coating.

B. Existing coatings shall be removed or thoroughly abraded to provide adequate surface profile for mechanical bond by the surfacing system. Applicator is to maintain strict adherence to the monolithic surfacing system manufacturer's recommendations with regard to proper surface preparation and compatibility with existing coatings.

2-02 Manufacturer and Equipment Supplier

A. Warren Environmental, Inc. or Contracting Officer approved equal.

2-03 Repair Materials

Repair materials must be accepted and approved by the monolithic surfacing system manufacturer for compatibility with the specified monolithic surfacing system and shall only be used as determined necessary by the Contracting Officer and Applicator.

2-04 Monolithic Surfacing System

A. Warren Environmental System M201 and S301 - a unique non-toxic, 100% solids, solventless epoxy resin laminar system as applied with a patent protected process and exhibiting the following characteristics.

Product type	Amine cured epoxy	
Color	White	
Solids Content (vol %)	100	
Compressive Strength	ASTM D695	12,000 psi
Flatwise Tensile Strength of		
Sandwich Constructions	ASTM C297	2,608 psi
Tensile Strength	ASTM D638	7,200 psi
Tensile Elongation	ASTM D638	2%
Flexural Strength	ASTM D790	13,000 psi
Flexural Modulus	ASTM D790	548,000 psi
Bond Strength - Concrete	ASTM D4541	900 psi
Chemical Resistance to:		
Sulfuric Acid, 10%	ASTM D543	Immersion
Sodium Hydroxide, 20%	ASTM D543	Immersion

- B. The monolithic surfacing system shall be applied in the field after all other work to the manhole is complete. This will insure a monolithic coating across the joints and connections. The monolithic surfacing system shall be continuously bonded to all brick, mortar, concrete, chemical sealant, grout, pipe, and other surfaces inside the manhole and therefore shall be designed for hydrostatic loading.
- C. The finished system shall provide a minimum total thickness of 60 mils. The cured surfacing shall be monolithic with proper sealing connections to all unsurfaced areas and shall be placed and cured in three applications in conformance with the recommendations of the monolithic surfacing system manufacturer.

D. When cured, the system shall form a continuous, tight-fitting, hard, impermeable surface that is suitable for sewer system service and chemically resistant to any chemicals, bacteria, or vapors normally found in domestic sewage and in industrial wastewater with the following parameters:

Parameter		Range
	Min	Max
Aluminum	2	30
Arsenic	0	0.01
Barium	1	5
Cadium	0	0.1
Chromium	0.01	1
Chromium, Hex	0.01	0.1
Cobalt	0	0.5
Copper	0.1	5
Iron	2	12
Lead	0	0.5
Manganese	1	100
Molybdenum	0	0.1
Nickel	0	25
Zinc	0.01	218
BOD ₅	100	1,000
COD	100	1,000
Ortho Phosphate, P	5	200
NH3-N	1	10
PH	3	12
TDS	50	5,000
TSS	50	5,000
Oil and Grease	50	200
Chloride	100	1,000
Fluoride	1	10
Sulfide	0	10
Sulfate	10	1,000
2-Butanone	0	0.05
2-Ethoxyethanol	0	20
4-Methyl-2-pentanone	0	0.1
Acetone	0.01	2
Benzene	0	0.5
Ethylbenzene	0	0.05
Ethylene glycol	10	100
Formaldehyde	0	0.1
Isobutanol	0	10
m.p-Xylenes	0	5
Methanol	0	10
Methylene chloride	0	0.5
Methyl-t-butyl ether	0	0.002
Naphthalene	0.001	0.2
n-Butanol	0	10
o-Xylene	0	5
Parameter Range		Range
	Min	Max
Phenolics	0	3
Styrene	0	0.002
Tetrachloroethene	0	0.2
Toluene	0	0.2
Xylenes, total	0.002	5

Temperature ⁰ F	50°	150°
Temperature, 1	50	150

- E. The system shall effectively seal the interior surfaces of the manhole and prevent any penetration or leakage of groundwater infiltration.
- F. The system shall be compatible with the thermal conditions of the existing sewer manhole surfaces.

2-05 Protective Coating Application Equipment

A. Heated, plural component, specially designed equipment for use in the spray or spincast application of the specified system approved for use by the monolithic surfacing system manufacturer.

PART 3 - EXECUTION

3-01 Pre-Coat Inspection

- A. All surfaces including benches, inverts, joints, lift holes and walls shall be made smooth and suitable for application of the interior surfacing system. All benches and inverts shall be in place and complete.
- B. Active flows shall be dammed, plugged, or diverted as required to ensure that the liquid flow is maintained below the surfaces to be coated.
- C. Installation of the protective coating shall not commence until the concrete substrate has properly cured in accordance with this Section.

3-02 Surface Preparation

- A. Applicator shall inspect all surfaces specified to receive the monolithic surfacing system prior to surface preparation. Applicator shall notify Contracting Officer of any noticeable disparity in the surfaces that may interfere with the proper preparation or application of the monolithic surfacing system.
- B. All concrete that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface. All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.
- C. Surface preparation method(s) shall be based upon the conditions of the substrate and the requirements of the monolithic surfacing system to be applied.
- D. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the monolithic surfacing system and the substrate.
- E. Applicator shall follow all regulations for contained space entry. The first procedure upon entering each structure will be to blast all specified surfaces by low pressure

water cleaning as defined by NACE Standard 5. When all loose and/or contaminated debris has been removed, the surface shall be water blasted by the use of a held wand again. The wash water shall include a dilute solution of chlorine to diminish microbiological bacteria growth and to kill any bacteria residing on or in the surface. The surface will be tested at this point to ensure that the pH is within acceptable limits (not to exceed 8.5). These tests will be performed with litmus paper on various areas within the structure. All test results will be retained for review by the Contracting Officer.

- F. Surfaces that require additional cleaning or profiling will be prepared by abrasive blast to rough the surface sufficient to obtain and ensure adequate bonding of the system. A minimum surface profile of 8-10 mils or 10% of the total recommended coating system thickness must be achieved to assure proper adhesion. Detergent water cleaning and hot water blasting may be necessary to remove oils and grease from the concrete. Whichever methods are used, they shall be performed in a manner that provides a uniform, sound clean surface that is not excessively damaged.
- G. Active water infiltration shall be stopped by using a cementitious water plug or hydroactive grout that is compatible and suitable for topcoating with the specified monolithic surfacing system.

3-03 Application of Repair Materials

- A. Application of repair materials shall be made by applicator. Repair materials shall meet the specifications of this Section. The materials shall be trowel or spray applied utilizing proper equipment on the specified surfaces.
- B. When using approved cementitious repair materials, such shall be troweled to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating. No bugholes or honeycomb surfaces should remain after the final trowel procedure of the repair mortar.
- C. The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds may not be used unless approved by the monolithic surfacing system manufacturer for compatibility with the specified system.
- D. Areas to be coated must be prepared after receiving a cementitious repair mortar and prior to application of the monolithic surfacing system.
- E. All surfaces shall be inspected during and after preparation and prior to application of the monolithic surfacing system. Any evidence of remaining contamination or laitance shall be removed by additional water or abrasive blast, or other approved method before proceeding with application of the monolithic surfacing system.
- **F.** All surfaces shall be sufficiently smooth and even, to ensure good flow handling characteristics when complete.

3-04 Application of Monolithic Surfacing System

- A. Application procedures shall conform to the recommendations of the monolithic surfacing system manufacturer, including material handling, mixing, environmental controls during application, safety, and equipment. The equipment shall be specially designated to accurately ratio and apply the specified materials and shall be regularly maintained and in proper working order.
- B. The specified materials must be applied by an approved installer of the monolithic surfacing system. All specified surfaces will be lined with the monolithic surfacing system to provide a minimum total thickness of 60 mils. The cured surfacing shall be monolithic with proper sealing connections to all unsurfaced areas and shall be placed and cured in three applications in conformance with the recommendations of the monolithic surfacing system manufacturer. Specially designed spray and/or spincast application equipment shall be used to apply each coat of the system.

PART 4 - TESTING AND INSPECTION

During application a wet film thickness gage, such as those available through Paul N. Gardner Company, Inc. meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application.

- 4-01 After the system has set hard to the touch it shall be inspected by the Contracting Officer verifying the following:
 - (a) Groundwater infiltration of the system shall be zero.
 - (b) All pipe connections shall be open and clear.
 - (c) No cracks, voids, pinholes, uncured spots, dry spots, lifts, delamination, or other type defects shall be evident in the system.
- 4-02 The testing shall be done after assembly of the manhole. All lift holes shall be plugged with a non-shrinking mortar, as approved by the Contracting Officer. The seal between the manhole sections shall be in accordance with ASTM C923. The contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe. With the vacuum tester set in place: (a) Inflate the compression band to 40psi to effect a seal between the vacuum base and the structure. (b) Connect the vacuum pump to the outlet port with the valve open. (c) Draw a vacuum to 10" of Hg. and close the valve. The test shall pass if the vacuum remains at 10" Hg. or drops to 9" Hg. in a time greater than one minute. If the manhole fails the initial test, the contractor shall locate the leak and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material.
- 4-02 A final visual inspection shall be made by the Contracting Officer and Applicator. Any deficiencies in the finished system shall be marked and repaired according to the procedures set forth herein by Applicator.

PART 5 - MEASUREMENT AND PAYMENT

5-01 Epoxy lining will not be measured and paid for separately. Cost of lining shall be included in the cost of the manhole.

DIVISION 2 - SITEWORK

SECTION 02602

SLIP ON FLAT BOTTOM CHECK VALVES

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SECTION 02602

SLIP-ON FLAT BOTTOM CHECK VALVES

PART 1 GENERAL

1.01 SUBMITTALS

- A. Submit product literature that includes information on the performance and operation of the valve, materials of construction, dimensions and weights, elastomer characteristics, flow data, headloss data, and pressure ratings.
- B. Upon request, provide shop drawings that clearly identify the valve dimensions.

1.02 QUALITY ASSURANCE

A. Supplier shall have at least ten (10) years experience in the manufacture of "duckbill" style elastomeric valves, and shall provide references and a list of installations upon request.

PART 2 PRODUCTS

2.01 "DUCKBILL" ELASTOMERIC CHECK VALVES

- A. Check Valves are to be all rubber of the flow operated check type with a slip-on connection. The Check Valve is designed to slip over the specified pipe outside diameter and attached by means of vendor furnished stainless steel clamps. The port area shall contour down to a duckbill, which shall allow passage of flow in one direction while preventing reverse flow. The valve shall be one piece rubber construction with nylon reinforcement. The duckbill shall be offset so that the bottom line of the valve is flat, keeping the invert of the pipe parallel with the invert of the valve. The top of the valve shall rise to form the duckbill shape. In sizes 20" and larger, the bill portion shall be thinner and more flexible than the valve body, and formed into a curve of 180°.
- B. Manufacturer must have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data. Company name, plant location, valve size and serial number shall be bonded to the check valve. Valves shall be manufactured in the USA.

2.02 FUNCTION

A. When line pressure inside the valve exceeds the backpressure outside the valve by a certain amount, the line pressure forces the bills of the valve open, allowing flow to pass. When backpressure exceeds the line pressure by at the same amount, the bills of the valve are forced closed. The flat bottom allows the valve to be installed where minimal bottom clearance exists.

2.03 MANUFACTURER

A. All valves shall be of the Series TF-1 as manufactured by the Red Valve Co., Inc. of Carnegie, PA 15106 or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Valve shall be installed in accordance with manufacturer's written Installation and Operation Manual and approved submittals.

3.02 MANUFACTURER'S CUSTOMER SERVICE

- A. Manufacturer's authorized representative shall be available for customer service during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.
- B. Manufacturer shall also make customer service available directly from the factory in addition to authorized representatives for assistance during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

DIVISION 2 - SITEWORK

SECTION 02660

WATER DISTRIBUTION SYSTEM

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SECTION 02660

WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1-01 DESCRIPTION

- A. This item shall consist of furnishing and installing all materials and performing all of the work necessary for and incidental to installing water distribution system, complete and ready for use.
- B. The work shall include the excavation, trenching and backfilling; furnishing and installing all trench sheeting and bracing; related appurtenances; storage and protection of materials; testing; clean-up; and all other operations necessary to complete the Work in accordance with the detailed Specifications contained herein.

PART 2 - MATERIALS

2-01 General

A. The Contractor shall furnish all materials necessary for or incidental to constructing a water distribution system. All materials shall be new and of first quality with certified tests for all pipe and fittings made at the manufacturer's plant to assure conformance with these Technical Provisions. Two (2) certified copies of each test result shall be furnished to the Contracting Officer.

All water construction and materials shall conform with the specifications of the Mississippi State Department of Health, DeSoto County Health Department, and North Mississippi Utility Company.

The kinds and classes of materials incorporated into the work shall be designated by the Contracting Officer. The Contractor shall not construe or interpret the several kinds of materials described herein as being EQUAL in their application for the Project.

2-02 DUCTILE IRON PIPE

- A. Ductile iron pipe shall be 250 psi Class 50 water pipe manufactured in accordance with the American Nationals Standard Institute's, Inc. Standard Specification ANSI-A21.51. The metal thickness of ductile iron pipe shall be in accordance with ANSI-A21.50.
- B. All ductile iron pipe shall be coated outside with a standard bituminous coating and cement lined inside in accordance with ANSI Standard Specification A-21.4.
- C. Rubber gasket joints for ductile iron pipe shall be either the push-on type or the mechanical joint type (as specified) and shall conform to the requirements of ANSI A-21.11.

- D. Ductile iron fittings shall be designed with a metal thickness based on a working pressure of three hundred fifty (350) psi for twenty-four inches (24") and smaller. All fittings shall be full-bodied or compact (when available) and manufactured in accordance with the latest requirements of ANSI Standard Specification A-21.10 or ANSI Standard Specification A-21.53, respectively.
- E. All fittings shall be either push-on joint or mechanical joint and shall be bituminous coated outside and cement lined inside in accordance with the latest edition of ANSI Standard Specification A-21.4.
- F. All pipe joints near bends, tees bulkheads, wyes, valves, fire hydrant legs, etc. may be mechanically restrained instead of using concrete blocking.
- G. Design information shall be submitted to the Contracting Officer for prior approval.
- 2-03 PVC PIPE (AWWA C900)
- A. Unplasticized polyvinyl chloride (PVC) pipe shall be manufactured from Class 12454–A or Class 12454–B Virgin Compounds (PVC 1120) in accordance with the requirements of ASTM Resin Specification D–1784.
- B. 6" PVC pipe shall conform to AWWA Standard Specification C900 and shall be Pressure Class 150 with a Dimension Ratio (DR) of 18.
- C. PVC pipe shall be joined by means of a rubber ring bell joint which shall be an integral and homogeneous part of the pipe barrel. Joint gaskets shall conform to ASTM D-1869.
- D. All PVC pipe shall bear the National Sanitation Foundation's (NSF) seal of approval.
- 2-04 POLYVINYL CHLORIDE (PVC) PIPE
- A. This specification covers the requirements for pressure rated unplasticized polyvinyl chloride (PVC) plastic pipe and joints for potable water use. Pipe shall be approved for potable water service and bear the seal of the National Sanitation Foundation. Pipe shall also conform to ASTM 3139 and "ASTM 3139" shall be printed on pipe.
- B. Pipe sizes ¾" through 4" shall conform to ASTM Specification D 2241, Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR). Pipe shall be pressure rated (PR) 160, with standard dimension ratio of SDR 26. Net laying lengths shall be 20 feet + 1 inch.
- C. PVC compounds shall comply with ASTM Specification D 1784, Rigid Poly (Vinyl Chloride) Compounds with physical properties and chemical resistance for cell classifications for pipe of 12454-B. Different cell classifications having one or more superior properties and clean reworked material generated by the manufacturer's own production shall be acceptable. Pipe compounds shall be approved for potable water use by listing for compliance with Standard No. 14 of the National Sanitation Foundation or equally recognized laboratory, and shall also be approved for the recommended

- hydrostatic design stress and be listed in the current Plastics Pipe Institute Technical Report, TR4.
- D. All pipe joints shall comply with ASTM D 3139, Joints for plastic Pressure Pipes Using Flexible Elastomeric Seals. Joint bells shall be formed integrally with the pipe and shall have a metal reinforced rubber sealing gasket permanently locked in during the production process. Pipe spigots shall be beveled and shall have insertion stopmarks.
- E. Gaskets shall be styrene butadiene rubber (SBR) specially developed to resist sun and UV and shall meet ASTM C443/C 505. Gasket shall also comply with the requirements of ASTM Specification F477, Elastomeric Seals (Gaskets) For Joining Plastic Pipe.
- F. Lubricant shall be suitable for potable water piping use at temperatures from 5 to 120 F (-15 to 50 C). It shall have no deteriorating effect on the gasket or pipe material. It shall be non-toxic and not support the growth of bacteria. If shall be water soluble and shall not impart taste or odor to water in a water line which has been properly flushed. Containers shall be labeled with the manufacturer's name and identified as PVC pipe joint lubricant. Each lubricant container shall have printed instructions for usage and joint assembly.

2-05 GATE VALVES

- A. Gate valves shall be manufactured in accordance with AWWA Standard Specification C-500 and shall be the non-rising stem, iron body, bronze mounted type right hand opening. All gate valves shall be hydrostatically tested to four hundred (400) psi for three-inch through twelve-inch (3"-12").
- B. Gate valve boxes shall be the cast iron extension type with screw adjustment and flare base. The minimum metal thickness shall be three-sixteenths inch $(^3/_{16}")$ and shall have a minimum diameter of five and one-fourth inches $(5\frac{1}{4}")$.

2-06 FIRE HYDRANTS

- A. Fire hydrants shall conform to the requirements of the AWWA Specifications for fire hydrants, valve openings and hub and pipe connections for 6" lines and be equipped for thirty-six inch (36") bury, unless otherwise specified.
- B. Fire hydrants shall be manufactured with two-two and one-half inch (2½") hose connections and one standard steamer connections. The thread pattern shall be in accordance with North Mississippi Utility Company specifications. Prior to ordering, the Contractor shall obtain written approval of the hydrant threads from the Contracting Officer.
- C. Fire hydrants shall open clockwise (to the right), shall have a one inch square operating nut, shall be of the compression type, with the proper drip valve and constructed so that they will not flood it when the barrel is broken.
- D. Hydrants shall have a coat of black asphalt paint below grade and red coat above grade.

- E. Fire hydrants shall be equipped with standardized mechanical joint inlets.
- F. All joints on fire hydrant legs (including the hydrant riser) shall be restrained by use of mechanically restrained joints in lieu of concrete blocking.

2-07 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures

PART 3 - EXECUTION

3-01 SITE PREPARATION

A. Clearing and grubbing shall generally conform to the requirements of Section 02111 and shall include the removal of structures and obstructions.

3-02 EXCAVATION AND TRENCHING

- A. All trenches shall be excavated to a depth to maintain the 36" minimum cover over the installed pipe.
- B. Bell holes and coupling holes of ample size shall be cut under and around all joints to assure that the body of the pipe shall rest uniformly and in continuous contact with the supporting ground for its entire length.

3-03 CONFLICTS WITH OTHER UTILITIES

- A. Where conflicts in grade occur with other underground utilities, the water line grade may be changed to avoid the conflict. All changes must have prior approval by the Contracting Officer.
- B. Whether the location of the water pipe is clearly defined by the Drawings or not, water mains located near sewer lines shall:
 - 1. Be laid at least ten (10) feet horizontally <u>and</u> 18 inches vertically from any sanitary sewer or manhole. The bottom of the water line should be at least 18 inches from the top of the sewer line.
 - 2. Where local conditions prevent adequate horizontal and vertical separation, the Contracting Officer must approve the water line to be laid closer to the sewer line and the following requirements must be met:
 - a. If local conditions prevent ten (10) feet horizontal separation, the water line should be ductile iron with water line joints located at the maximum distance possible from sewer line joints. PVC pipe may be used if it is protected by a steel casing. Also, the water main and sewer lines must be in separate trenches with adequate

- space for maintenance. In some cases, special sewer line construction procedures may be required.
- b. If the proper horizontal <u>and</u> vertical separation cannot be maintained, condition 1. must be met <u>and</u> the sewer line shall be constructed according to water main standards. **Note:** Where water lines cross sewer lines, the above requirements will be waived if pipe segments are centered to provide maximum spacing of joints of both water and sewer lines and a vertical separation of at least 18 inches is maintained (water over sewer).

3-04 PIPE PLACEMENT

- A. Pipe, specials and fittings shall be carefully laid to the line and grade established or directed by the Contracting Officer. The bed of each piece of pipe is to be shaped either by trimming the bottom of the trench or by placing excavated earth therein and tamping so that each piece of pipe will have a uniform bearing. The trench shall be further excavated around each bell, hub or coupling so that it will be entirely clear of the ground and leave ample room for tightening mechanical joint bolts where employed.
- B. The inside of the bells and the outside of the spigots shall be thoroughly cleaned before they are placed. The inside of the pipes shall be kept clean and free of all obstructions and foreign matter until the work is completed and accepted.
- B. Where pipe laying is stopped at the end of the day or for any other cause, the end of the pipe shall be securely closed in order to prevent the entrance of water, mud or any other objectionable matter.
- C. All pipe shall be carefully lowered into the trench with rope slings or other approved means in such a manner as to prevent damage to the pipe or the pipe coating. Pipe shall be installed with the bell ends pointing in the direction in which the work is to proceed.
- 3-05 Ductile Iron Pipe Joint Construction
- A. Mechanical Joints: The mechanical joint surfaces which come in contact with the gasket shall be thoroughly brushed with a wire brush just prior to assembly. The gasket should be brushed with soapy water prior to installation to remove loose dirt and to lubricate gasket as it is forced into its retaining space.
 - When tightening bolts, it is essential that the gland be evenly brought up toward the pipe flange. The bolts should be partially tightened; bottom bolt first; top bolt second; then the bolts on either side; last, the remaining bolts. All bolts shall be torqued to the pounds specified by the manufacturer or the applicable ASTM Standard. Overstressing of bolts to compensate for poor installation will not be permitted.
- B. Slip-On Joints: When slip-on joint pipe is used, the pipe must be cleaned with a wire brush and the spigot end of the pipe lubricated with a thin film of lubricant. The gasket

shall be inserted into bell socket recess and the spigot end pushed "home". The joint shall be installed in accordance with the manufacturer's instructions.

3-06 SETTING FITTINGS, VALVES AND HYDRANTS

- A. All fittings, valves, valve boxes, hydrants and other appurtenances shall be set at the location indicated on the Plans or as directed by the Contracting Officer.
- B. Fire hydrants shall be set on a concrete base at least twelve inches (12") square and four inches (4") thick. Hydrants shall be erect and shall stand to the proper height above the ground with the lowest nozzles at least 12 inches above the ground. Beneath and around each hydrant and extending at least above the drip shall be placed approximately one-fourth (¼) cubic yard of washed gravel in order to provide for drain water absorption. The ground shall be securely tamped up to the surface around each hydrant and smoothed over in the same manner as specified for trenching. Hydrants and hydrant legs shall be secured by use of restrained joints.
- C. Hydrants, valves and fittings (i.e., bends, tees, plugs and caps) shall be securely braced by restrained joints to prevent the possibility of blowing off under pressure.

3-07 HYDROSTATIC AND LEAKAGE TESTS

- A. After the pipe has been laid and partially backfilled, all newly laid pipe or any valved sections thereof shall be tested in accordance with Section 4 of AWWA Standard C-600 "Installation of Gray and Ductile Cast-Iron Water Main and Appurtenances" and all amendments and additions thereto.
- B. North Mississippi Utility company shall be present during hydrostatic and leakage testing.
- C. If any test of pipe laid discloses leakage greater than the specified, the Contractor shall (at his own expense) locate and repair the defective joints until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

3-08 DISINFECTION

- A. Before each section of work is placed in service, it shall be thoroughly flushed out to remove any dirt or foreign matter from inside the lines. The lines shall be disinfected to meet the requirements of the Mississippi State Board of Health and North Mississippi Utility Company. After completion of the construction and pressure testing of water distribution, lines, they shall be flushed and disinfected using at least a 50mg/l free chlorine solution, such that a minimum residual concentration of 25mg/l will be left after a 24 hour retention period or as described in the latest revision of AWWA C-651.
- B. After completion of the construction and disinfection of any section water mains, the Contractor shall arrange for a representative of North Mississippi Utility Company to take samples from every dead end line and every major looped line for bacteriological examination. Water being collected for testing shall not have a chlorine residual higher

than is normally maintained in other parts of the distribution system. No chlorine shall be present which is a result of line disinfection. Less than one coliform bacteria per 100 ml and no confluent growth indication shall constitute a satisfactory sample when analyzed by the Mississippi Department of Public Health Laboratory or a laboratory certified by the Mississippi State Department of Health. If the submitted samples are not satisfactory, the system shall be disinfected and re-disinfected in a manner meeting the requirements of the Mississippi State Department of Health until the system is free from contamination.

C. The Contractor will provide the Contracting Officer with a record copy of the test results of each sample submittal to the Board of Health.

3-09 BACKFILLING

- A. General: The trenches shall be carefully backfilled with the excavated materials, approved for backfilling. The backfill material shall be tested every 100 lf or each days production, if less than 100', with one test for each vertical foot of fill. Testing shall be paid for by the Contractor.
- B. Backfill material shall consist of earth, loam, sandy clay, sand and gravel or other approved materials free from large clods of earth or stones. Backfill shall be carefully rammed and compacted in place.
- C. Trenches within roadways or other areas to be paved shall be backfilled to the top of the subgrade or the ground surface in 6 inch layers, and each layer shall be compacted to a density at least 95% of maximum density as determined by AASHTO Method T-99. The surface shall be graded to conform with the surrounding ground surface.
- D. Trenches in open areas shall be backfilled to a point one (1) foot above the top of the pipe in 6 inch layers. Each layer shall be compacted to a density of at least 90% of the maximum density as determined by AASHTO T-99. The remainder of the backfill above the 1 foot level shall be properly and carefully compacted to the density of the adjacent earth, and the surface shall be mounded over the trench and left in a uniform and neat condition satisfactory to the Contracting Officer.
- E. After the water main has been partially backfilled and prior to back-filling the trench, a hydrostatic and leakage test will be performed in accordance with Paragraph 3-07 of this section.

3-10 CLEAN-UP

A. After backfill of pipe and structures is completed, the area shall be graded to conform with the surrounding ground or to grade indicated, as applicable. The Contractor shall dispose of all surplus material, dirt and rubbish. Surplus material shall be deposited at locations and in a manner approved by the Contracting Officer.

3-11 INSPECTION

- A. Prior to final approval of the system, the Contractor and Contracting Officer shall conduct a thorough inspection of the entire installation. Any indication of defects on material or workmanship or any obstruction to the flow in the pipe system shall be corrected.
- B. All defects shall be corrected by the Contractor without additional compensation and in a manner acceptable to the Contracting Officer.
- 3-12 MAINTENANCE: The Contractor shall be responsible, until final acceptance and without extra compensation, for the maintenance of all water lines and structures to the lines and grades established for the construction, for the stability of all backfills and the finished grades above the water lines and around the structures, and for the repair and replacement of all items which were damaged or removed during the construction. Restoration of pavement, base courses, driveways, curb and gutter, sidewalks and other items shall conform to the requirements specified in other sections of the Specifications.

DIVISION 2 - SITEWORK

SECTION 02700

LIME TREATED BASE COURSE

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SECTION 02700

LIME TREATED BASE COURSE

PART 1 - GENERAL

1-01 DESCRIPTION

This work shall consist of constructing one or more courses of a mixture of soil, hydrated lime, all in accordance with these specifications and MSHD State Aid specifications, 1989 edition, Section S-307 in reasonable close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Contracting Officer.

The work shall include preparation of the roadbed and/or site subgrade, incorporation of lime, and processing in accordance with the following method:

A. Class C lime treatment shall consist of spreading the specified percentage of lime, mixing compacting, and finishing.

The Government and Contracting Officer reserves the right to modify by Change Order the class of treatment or to eliminate lime treatment from certain sections or to add other sections for lime treatment depending on the results of soil tests.

PART 2 - MATERIALS

2-01 MATERIALS TO BE TREATED

The material to be treated shall consist of existing roadbed and/or site subgrade material or material added as directed. Particles of aggregate retained on a three inch sieve and deleterious substances such as roots, stumps, grass, turf, and other vegetable matter shall be removed and replaced with suitable material.

2-02 WATER

Water used in this construction shall meet the requirements of MSHD State Aid specifications Section S-714.01.3.

2-03 LIME

Lime shall meet the requirements of MSHD State Aid specifications Section S-714.03.

Lime shall be stored and handled in closed, weather-proof containers until distribution on the section of road being processed. If local storage is provided, lime shall be used only from approved storage facilities and shall meet the requirements of the contract time of use.

The Contractor is reminded of the highly caustic characteristic of quick lime and shall instruct employees as to preventive and protective measures to take prior to their working with quick lime. Further, the Contractor shall take all precaution necessary to prevent

injury to persons not in his employ and to livestock. Quick lime which is spilled or deposited at places other than on areas designated to be treated shall be immediately picked up, buried, or slaked by wetting to eliminate to hazard. Dry quick lime shall not be used in the "Dry Application" Method.

2-04 CURING SEAL

Curing seal shall be Emulsified Asphalt, Grade EA-1, CMS-2h, or MS-2h.

2-05 EQUIPMENT

Equipment necessary for proper prosecution of the work shall be on the project and approved by the Contracting Officer prior to its use.

When bulk lime is used, batch-type or platform scales shall be provided. Batch type or platform scales shall meet the requirements for aggregate scales in MSHD and MSHD State Aid Specifications. All scales shall be located at approved locations on or near the project.

When bulk lime is used, the Contractor shall provide approved mechanical spreader(s) having adjustable strike-off gate(s), or other approved spreading equipment constructed so as to provide positive control of the spread. Approval of a spreader will be contingent upon its known or demonstrated ability to make distribution of lime within the tolerances allowable.

Mixing and scarifying equipment shall be capable of positive depth control. Mixing shall be performed with approved rotary-type mixers or other approved equipment.

Rollers shall be of sufficient number, type, size, and weight to accomplish the required compaction.

The Contractor may use approved alternate equipment provided it produces work meeting the requirements of these specifications.

PART 3 - CONSTRUCTION REQUIREMENTS

3-01 GENERAL

Quantities and percentages of lime shown on the plans and proposal are based on preliminary soil investigation and dry laboratory sample test. The actual application rate will be established from tests made just prior to beginning treatment. The Contractor is hereby advised that the estimated contract quantity of lime is based on application rates of hydrated lime. The use of quick lime will not be permitted in the "Dry Application" method. The Contractor will be permitted to apply only hydrated lime in the "Dry Application" method.

It is necessary that lime treated materials be kept moist at all times. It shall be the Contractor's responsibility to provide sufficient equipment and keep all partially constructed or completed lime stabilizer layers sufficiently and continually moist until a succeeding layer has been placed thereon or until release of maintenance of the project.

The first section of each mixing operation, both initial and final, will serve as a test section. The length of the test section (not less than three hundred fifty (350) linear feet for more than five hundred (500) linear feet for the designated width) will be determined by the capabilities of the equipment provided to perform the work. The Contracting Officer shall determine the appropriate depth of mixing for site conditions at the time of construction. The depth of mixing can be considered to be at least 8" and not more than 24" for the purpose of bidding. The Contracting Officer and Contractor will evaluate the results of the test section in relation to contract requirements. In case the Contracting Officer determines the work is not satisfactory, the contractor shall revise his procedures and augment or replace equipment as necessary to assure work is completed in accordance with the contract and shall correct any deficient work at no additional cost to the Government.

3-02 PREPARATION OF GRADE

Before treatment, the roadbed shall be prepared in accordance with the requirements of the Earthwork Section of the specifications contained elsewhere herein.

Prior to the application of dry hydrated lime, a light windrow shall be bladed along the edges of the area to be treated, or the surface on which the lime is to be applied shall be scarified to retain the spread dry lime.

The depth of scarification shall be carefully controlled so that the surface of the roadbed and/or site subgrade below the scarified material will remain undisturbed and conform as closely as possible to the established cross section.

3-03 APPLICATION OF LIME

The rate of application of lime shall be 4.5 percent (4 lbs per sq. yd per inch depth) of hydrated lime (by weight) in an effort to facilitate drying of subgrade. The depth will be determined during construction by the Contracting Officer. The depth can be considered not less than 8" nor more than 24" for the purpose of bidding. This application shall be done only at the discretion of the Contracting Officer.

Application of lime shall be accomplished by an approved "dry application".

The following guidelines will govern the acceptability of the method to be used:

<u>Dry Application</u>. Hydrated lime applied by this method shall be spread uniformly and shall be sprinkled with sufficient water to prevent loss of lime by wind. Spreading of hydrated lime when wind and weather conditions are unfavorable will not be permitted nor will spreading of lime by motor patrol be acceptable.

The distribution of lime at the rate specified shall be attained by one or more passes over a measured section until the specified percentage of lime has been spread. After each successive pass, the material shall be incorporated into the soil with the mixing equipment. Additional water, if necessary, shall be added and mixed into the mass to hasten mellowing.

Payment will not be made for lime that has been spread and exposed for a period of six hours or more before mixing. Such areas shall be treated again with the full required rate of application.

Additional lime shall be added at the Contractor's expense to all section on which excessive loss has occurred due to washing or blowing.

The quantity of lime applied on a section shall be spread uniformly and shall not vary more than plus or minus five percent of the quantity ordered. No payment will be made for lime application exceeding the five percent plus tolerance. When the quantity applied is deficient by more than five percent, additional lime shall be applied prior to mixing.

3-04 MIXING

For Class A and Class B treatments, the lime and water shall be Initial Mixing. incorporated uniformly into the soil. The mixing and watering operation shall be continued until a homogeneous mixture that will pass a three-inch sieve is obtained. After satisfactory mixing is obtained, the layer shall be reshaped to line, grade, and section and sealed with a light roller no later than the next day following mixing. The sealed mixture shall then be left to mellow for the period specified in the lime mix design furnished by the Contractor's approved testing laboratory and approved by the Contracting Officer. The mellowing period will be measured in degree days. This period will not be less than five (5) calendar days nor more than twenty (20) calendar days. The temperature to be used to determine the degree days mellowing period will be the average of the high and low temperatures for each day of the mellowing period. In the event the average is 50°F or less, that day will not be used in computing the degree days mellowing period. During the mellowing period the partially treated course or layer shall be kept moist by sprinkling. All sections on which the surface becomes dry during the mellowing period shall be reprocessed to the satisfaction of the Contracting Officer or reconstructed in accordance with the specifications.

For Class C treatment, the lime and water shall be incorporated uniformly into the soil. The mixing and water application shall be continued until a homogeneous mixture of which one hundred (100) percent of the material by dry weight, exclusive of gravel and stone, will pass a two-inch sieve and sixty (60) percent will pass a No. 4 sieve. At the completion of moist mixing and during the compaction operations, the percentages of moisture shall be that necessary to obtain the required density. There will be no mellowing period, and compaction shall begin immediately. The mixing, water application, and final compaction shall be completed during the same work day.

3-05 FINAL MIXING

After the required mellowing period (Class A and B), the layer shall be scarified, and in the case of Class A treatment the second application of lime added. The layer shall then be remixed as prescribed in the initial mixing operations. Mixing shall continue until one hundred (100) percent of material by dry weight, exclusive of gravel and stone, will pass a 2-inch sieve and sixty (60) percent will pass a No. 4 sieve. At the end of mixing and

during compaction, the moisture in the mixture shall be that necessary to obtain the required density.

3-06 THICKNESS REQUIREMENTS

For the purpose of determining reasonable conformance with the designated thickness of a course, the specified value (SV) for thickness will be the designated thickness. The unit of deviation will be \pm 0.3 inch. All sections not in reasonably close conformity because of deficient thickness shall be reprocessed to meet specification requirements. In each case, reprocessing and addition of lime shall be at the Contractor's expense.

3-07 COMPACTION

Compaction of the mixture shall begin immediately after the required mixing operation has been completed. Compaction shall be completed during same day it was begun and shall provide uniform and continuous compaction from bottom to top of the layer. The mixture shall be aerated or watered as necessary to obtain the moisture content required for the specified density.

Throughout the entire compaction operation, depression, defective areas, or soft spots which develop shall be corrected immediately by scarifying the area, adding lime when required, or removing the material, and reshaping and compacting in accordance with these specifications and at the Contractor's expense.

The specified value (SV) for density for Classes A, B, and C lime treatment will be ninety eight (98) percent of Standard Proctor.

3-08 FINISHING, CURING, PROTECTION AND MAINTAINING

The surface of the layer shall be smooth and conform to the lines, grades, and cross sections shown on the plans or established by the Contracting Officer.

The surface of the lime treated course shall be kept moist and otherwise satisfactorily maintained until placement of the subsequent course or layer. If the next course is to be granular material, the first layer placed shall be at least four inches in thickness. During placement of the subsequent course or layer, the least possible hauling will be permitted over the unprotected lime treated course. Except as provided in the following paragraph, the subsequent layer or course shall be placed and compacted within two days after the lime treated course has been finished.

At his option, the Contractor may defer placement of the subsequent course or layer for up to twenty-one (21) days by placing a bituminous curing seal over the lime treated course within two days after finishing the course. The lime treated course shall be kept moist until application of the curing seal. When a curing seal is used, the emulsified asphalt shall be applied at the consistency specified in MSHD State Aid specifications section S-702 without further dilution. The rate of application shall be 0.25 gallon per square yard. A minus tolerance of five percent will be allowed.

Should the Contractor fail to cover a lime treated course with the curing seal or subsequent course within the times specified, the Contracting Officer will suspend all other work and withhold payment of the current estimate(s) until all damage resulting therefrom is repaired and the treated course is covered with the curing seal or the subsequent course, as the case may be.

Maintenance of the curing seal shall be in accordance with the provisions of MSHD State Aid Specification Section S-408.09. When necessary for the maintenance of vehicular traffic, the Contractor shall furnish and apply blotter material in accordance with MSHD State Aid Specifications Section S-408.03 and S-408.08.

All damage from freezing, as determined by the Contracting Officer, that may occur in a treated course prior to being covered by the next course shall be corrected by reprocessing the course with Class C treatment at the Contractor's expense. The Contractor shall add the quantity of lime necessary to restore the CBR of the damaged material to that shown on the mix design. In no case shall the quantity of added lime be less than two percent by weight.

PART 4 - COMPENSATION

4-01 Method of Measurement

Mixing for accepted lime treated subgrade will be measured by the square yard (SY) regardless of depth, complete in place, as directed by the Contracting Officer.

Lime for accepted lime treated subgrade will be measured by the ton (TN) delivered and placed on the soil to be treated.

Lime in excess of the allowable tolerance and all lime required to be furnished by the Contractor at no additional cost to the Government will be deducted from measured quantities.

Water and curing seal will not be measured for separate payment.

Testing will not be measured for separate payment.

4-02 BASIS OF PAYMENT

Accepted quantities of lime treated subgrade will be paid for as follows:

Lime mixing will be paid for at the contract unit price per square yard (SY). The prices thus paid shall be full compensation for completing the work specified.

Lime will be paid for at the unit price per ton (TN). The prices thus paid shall be full compensation for completing the work specified.

DIVISION 2 - SITEWORK

SECTION 02810

IRRIGATION SYSTEM

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SECTION 02810

IRRIGATION SYSTEM

PART 1 - GENERAL

1-01 DESCRIPTION

- A. Provide an underground irrigation system in accordance with these specifications and as shown on the approved Irrigation Design Drawing prepared by Contractor. Work includes:
 - 1. Design and installation of automatic irrigation system including piping, fittings, sprinkler heads, valves, and accessories.
 - 2. Irrigation controller, controller wire, and rain switch,
 - 3. Pipe sleeves.
 - 4. Excavating and backfilling irrigation system work.
 - 5. Associated plumbing and accessories to complete the system.
 - 6. System testing.
 - 7. System maintenance until Substantial Completion and thereafter as specified.
 - 8. Installation of the following items and coordination with the General Contractor:
 - a. Water tap and separate water meter and backflow preventer for irrigation system.
 - b. Provision for electric power for the irrigation controller.

B. RELATED WORK:

- 1. Section 02485: Bermuda Sod
- 2. Section 02490: Trees, Shrubs, and Ground Cover

1-02 OUALITY ASSURANCE

- A. Comply with relevant specifications in Division 2, as well as other divisions.
- B. Installer's qualifications: Minimum of 5 years experience installing irrigation systems of comparable size.
- C. Materials, equipment, and methods of installation shall comply with the following:
 - 1. Appropriate local and state codes and standards.
 - 2. National Fire Protection Association (NFPA): National Electric Code.
 - 3. American Society for Testing and Materials (ASTM).
 - 4. National Sanitation Foundation (NSF).
 - 5. The Irrigation Association (IA).
- D. Excavating, backfilling, and compacting operations: Comply with Section 02200 requirements and as specified.

1-03 SUBMITTALS

- A. Submit a complete, detailed Irrigation Design drawing for the irrigation system. This drawing, upon review and approval, will become part of the Contract Documents. Include location of water tap and backflow preventer, piping layout and sizing, location and type of sprinkler heads, valves (numbered, with GPM rates), controller and electrical service, and a complete schedule of parts and fittings.
 - 1. System shall be designed for head-to-head coverage, with capability for 1" water/hour coverage. Coverage area includes:
 - 2. Lawn and planting beds as indicated on plans.
 - 3. Keep walks and paved areas dry.
 - 4. Provide separate zones for lawn verses planting areas. Indicate sprinkler head coverage on Design Drawing. Indicate hydrostatic water pressure on Design Drawing.
 - 5. Piping must be laid out to avoid roots of new trees. If heads must be located near existing trees, the pipe route should be aimed radially toward the tree, not across the root zone. This configuration may result in extra pipe and trenching costs.
 - 6. Contact project consulting Contracting Officer for possible locations of water tap and meter.
 - 7. Verify exterior location of irrigation controller with project architect. Coordinate with General Contractor for location of 110V electric service.
- B. Submit manufacturer's product data and installation instructions for each of the system components.
- C. Submit the following equipment samples:
 - 1. Not required in this contract.
- D. Submit written documentation of time, date, and results of pressure test.
- E. Upon irrigation system acceptance, submit written operation and maintenance instructions, including winterization procedure.
- F. Provide a Record Drawing of irrigation system:
 - 1. Prepare a hard-line drawing to record actual construction. Include all information indicated on original approved Contractor's Design Drawing, for complete delineation of system.
 - 2. Identify field layout changes and changes made by Change Order.

1-04 DELIVERY, STORAGE, AND HANDLING

A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.

- B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, both threaded or plain.
- C. Store and handle materials to prevent damage and deterioration.
- D. Provide secure, locked storage for valves, sprinkler heads, and similar components that cannot be immediately replaced, to prevent installation delays.

1-05 PROJECT CONDITIONS

- A. Known underground and surface utility lines are indicated on Contract Documents.
- B. Protect trees, planting beds, lawns, and other features designated to remain as part of the final landscape work. Tree protection shall include protection of root zones within drip line of canopy.
- C. Promptly repair damage to adjacent facilities caused by irrigation system work operations. Cost of repairs at Contractor's expense.
- D. Promptly notify the project civil Contracting Officer of unexpected sub-surface conditions.
- E. Any deviations between Contractor's Design Drawing and actual construction of irrigation system must by approved by the Contracting Officer. Final system layout shall be acceptable to Contracting Officer.
- F. Cutting and patching (as required):
 - 1. Cut through concrete and masonry with core drills. Jack hammers not permitted.
 - 2. Materials and finishes for patching shall match existing cut surface materials and finish. Exercise special care to provide water tight patching at openings in exterior walls.
 - 3. Methods and materials used for cutting and patching shall be acceptable to the Contracting Officer.

1-06 WARRANTY

A. Provide one-year warranty from date of system acceptance. Warranty shall include replacement of all defective materials and workmanship.

PART 2 - PRODUCTS

2-01 MATERIALS

A. General:

1. Provide only new materials, without flaws or defects and of the highest quality of their specified class and kind.

- 2. Comply with pipe sizes indicated. No substitution of smaller pipes will be permitted. Larger sizes may be used subject to acceptance of the Contracting Officer. Remove damaged and defective pipe.
- 3. Provide pipe continuously and permanently marked with manufacturer's name or trademark, size schedule and type of pipe, working pressure at 73 degrees F and National Sanitation Foundation (NSF) approval.

B. Plastic pipe, fittings, and connections:

- 1. Polyvinyl chloride pipe: ASTM D2241, rigid, unplasticized PVC, extruded from virgin parent material. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles, and dents.
 - a. Main line pipe and sleeving: Schedule 40, ASTM D1785.
 - b. Lateral line pipe: Class 200, ASTM D2241.
- 2. PVC pipe fittings: ASTM D2241 Schedule 40 PVC molded fittings suitable for solvent weld, screwed connections. Fittings made of other materials are not permitted.
- 3. Solvent cements for PVC pipe and fittings: ASTM D2564 standard specification, and ASTM D2855 Standard Recommended Practices for Making Solvent Cemented Joints for PVC Pipe and Fittings.
- 4. Sprinkler and rotor head connections: ASTM D2239 flexible 3/8" polyethylene pipe, with ASTM D2609 plastic insert fittings.

C. Sprinkler heads:

- 1. Rotary type sprinkler heads shall be pop-up type with screens, fully adjustable for flow and pressure. Refer to Contractor's Design Drawing for spray pattern.
- 2. Spray type sprinkler heads shall be pop-up type with screens, fully adjustable for flow and pressure. Refer to Contractor's Design Drawing for spray pattern.

D. Valves:

- 1. Gate valves: bronze construction, non-rising stem, inside screw with threaded ends. Refer to Contractor's Design Drawing for size and other requirements.
- 2. Automatic Drain Valves: ½" male pipe thread inlet, plastic body, opening pressure 2-3 PSI, closing pressure 4-6 PSI.

E. Controller(s):

1. Automatic controller, microprocessor solid state with visible readout display and temporary override feature to bypass cycle for inclement weather. Timer to include the number of stations indicated on Contractor's Design Drawing, programmable for 7 to 14 days, in .10 and .25 hour increments, with automatic start and shutdown.

F. Electrical control wire:

- 1. Electrical control and ground wire: Type UF 600 volt AWG control cable #14 or larger. Aluminum wire is not acceptable.
- 2. Wire color code: Provide control or 'hot' wires either black or red in color. Provide common or 'ground' wires in white color.

G. Water line tap and water meter:

1. In accordance with local and applicable codes and as indicated on Contractor's Design Drawing.

H. Back flow preventer and cover:

1. Double check valve reduced pressure zone type. Refer to American Water Works Association (AWWA) C506: *Back Flow Prevention Devices Reduced Pressure Principle and Double Check Valve Types*. Cover to be constructed of rigid insulated fiberglass, dark green color, secured to base as approved.

I. Quick coupler valve (if specified):

1. Manual valve and key assembly allowing connection and operation of a single sprinkler head of hose from the irrigation mainline. Quick coupler valve to have metal lid, mounted in a 12" round plastic valve box. For each quick coupler valve, provide (1) quick coupler key with 6 GPM full circle brass impact sprinkler head, or (1) ¾" brass hose swivel (as indicated on Contractor's Design Drawing).

2-02 ACCESSORIES

- A. Drainage fill: ½" to ¾" washed pea gravel (only as required).
- B. Fill: Clean soil free of stones larger than 2" diameter, foreign matter, organic material, and debris.
 - 1. Provide imported fill material as required to complete work. Obtain rights and pay all costs for imported material.
 - 2. Suitable excavated materials removed to accommodate the irrigation system work may be used a fill material subject to the Contracting Officer's review and acceptance.
- C. Low voltage wire connectors: Socket seal type wire connectors and waterproof sealer.
- D. Valve access boxes: Constructed of rigid, durable plastic with plastic cover plate, manufactured by "Amtec" (or equal). Refer to Contractor's design Drawing for size of valve access box.

PART 3 - EXECUTION

3-01 APPROVAL OF CONTRACTOR'S DESIGN DRAWING

A. Do not commence work until Contractor's Design Drawing is approved in writing by Contracting Officer.

3-02 INSPECTION

A. Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.

3-03 PREPARATION

A. Layout and stake the location of each pipe run and all sprinkler heads and sprinkler valves. Take care to avoid root zones of existing trees. Obtain Contracting Officer's acceptance of layout prior to excavating.

B. Sleeves:

- 1. Provide sleeves for all locations indicated on approved Contractor's Design Drawing, and in general where pipe and controller wire is under paved surfaces, curbs, walls, steps, ramps, etc. Where piping is shown under paved areas that are adjacent to turf areas, install the piping in the turf areas.
- 2. Install piping sleeves under existing paving by jacking, boring, or hydraulic driving of the sleeve. Sleeves shall fit snugly in circular holes cut by hydraulic borer.
- 3. If any existing paving is expressly designated for removal to accommodate sleeving, paving shall be carefully saw cut to provide a uniform straight transition from new to existing paving. Replacement paving to be of the same materials, textures, and colors. Joints and patterns to match existing adjoining paving surfaces. Obtain Contracting Officer's permission before cutting any paved surfaces.
- 4. Entire operation to be carried out in such manner to prevent settlement of overhead soils or pavements, and to forestall present or future damage to any overhead improvements.

3-04 INSTALLATION

A. Excavation and backfilling:

- 1. All excavation shall be considered unclassified excavation and include all materials encountered.
- 2. Excavate trenches of sufficient depth and width to permit proper handling and installation of pipe and fittings.
- 3. If the pulling method is used, the pipe "plow" shall be a vibratory type. Starting and finishing holes for pipe pulling shall not exceed a 1'-0" by 3'-0" opening.

- 4. Excavate to depths required to provide 2" depth of earth fill or sand bedding for piping when rock or other unsuitable bearing materials is encountered.
- 5. Fill to match adjacent grade elevations with approved earth fill material. Allow for settling. Place and compact fill in layers not greater than 8" depth.
 - a. Provide approved earth fill or sand to a point 4" above the top of pipe.
 - b. Fill to within 6" of final grade with approved excavated or borrow fill materials free of lumps or rocks larger than 3 " in any dimension.
 - c. Provide clean topsoil fill free of rocks and debris for top 6" or fill.
- 6. Restore any settled trenches to finished grade, including the necessary restoration and/or replacement of grass sod, plant materials, and mulch.
- 7. Provide 1 cu. ft. of drainage fill aggregate around each pop-up impact type of sprinkler head to permit drainage of water from the sprinkler case. Top of aggregate to be 4" below finished grade, with soil on top (only if so indicated on Contractor's Design Drawing).
- 8. Install irrigation lines with a minimum cover of 18" to 24" based on finished grades. If trenching encounters tree roots or other obstructions, cease work immediately and notify Contracting Officer.
- 9. Excavate trenches and install piping and fill during the same working day. Do not leave open trenches or partially filled trenches open overnight.

B. Plastic pipe:

- 1. Install plastic pipe in accordance with manufacturer's installation instructions. Provide for thermal expansion and contraction.
- 2. Saw cut plastic pipe. Use a square-in-saw vice, to ensure a square cut. Remove burrs and shavings at cut ends prior to installation.
- 3. Make plastic to plastic joints with solvent weld joints recommended by the pipe manufacturer. Install plastic pipe fittings in accordance with pipe manufacturer's instructions. Contractor shall make arrangements with pipe manufacture for all necessary field assistance.
- 4. Make plastic to metal joints with plastic male adapters.
- 5. Make solvent weld joints in accordance with manufacturer's recommendations.
- 6. Allow joints to set at least 24 hours before pressure is applied to the system.
- 7. Maintain pipe interiors free of dirt and debris. Close open ends of pipe by acceptable methods when pipe installation is not in progress.

C. Sprinklers, fittings, valves, and accessories:

- 1. Install fittings, valves, sprinkler heads, risers, and accessories in accordance with manufacturer's instructions, except as otherwise indicated.
 - a. Provide concrete thrust blocks where required at fittings and valves.
- 2. Set sprinkler heads perpendicular to finished grades, except as otherwise indicated. Set top of sprinkler head flush with adjacent grade of soil or mulch layer.
- 3. Install pop-up spray heads and gear driven sprinklers with a flexible 3/8" polyethylene pipe connection to lateral line; using standard insert elbows.

- 4. Locate sprinkler heads to assure proper coverage of indicated areas. Do not exceed sprinkler head spacing distances indicated.
- 5. In non-traffic areas, install risers for spray heads in shrub, ground cover, or flower beds of sufficient height to prevent interruption of water stream by plant material. Confirm required locations for risers with Contracting Officer.
 - a. Provide risers of ½" Schedule 40 PVC and nozzle adapters.
 - b. Paint exposed plastic risers with 1 coat black or dark green paint.
 - c. Set risers in a row with top level and in line.
- 6. Connect quick coupler valve (if specified) to main line with PVC 'O' ring type triple swing joint, stabilized with ½" metal rod and galvanized clamp stabilizers. Install in 12" round plastic valve box, filled with pea gravel. Valve to be centered in box and 4" below top.
- 7. Install fittings and accessories as shown or required to complete the system.
- 8. Install in-ground control valves in a flush mounted valve access box as indicated.
- 9. Install valve access boxes on a suitable base on gravel (6" minimum thickness) to provide a level foundation at proper grade and to provide drainage of the access box.
- 10. Seal threaded connections on pressure side of control valves with teflon tape or approved plastic joint type compound.

D. Controller and control wiring:

- 1. Install controller as indicated on Contractor's Design Drawing and as approved by Contracting Officer, including connection to 110 V service.
- 2. Install electric control cable in the piping trenches wherever possible. Install wire with slack to allow for thermal expansion and contraction. Expansion joints in wire may be provided at 200-foot intervals by making 5-6 turns of the wire around a piece of 1/2" pipe instead of slack. Where necessary to run wire in a separate trench, provide a minimum cover of 12".
- 3. Provide sufficient slack at all connection, valves and at ends of wire terminators, and at all wire splices to allow raising the valve bonnet or splice to the surface without disconnecting the wires when repair is required.
- 4. Connect each remote control valve to one station of the controller, unless otherwise indicated. Maintain the valve number and numerical sequence of each valve zone as indicated on Contractor's Design Drawing.
- 5. Connect remote control valves to a common ground wire system.
- 6. Make wire connections to remote control electric valves and splices of wire in the field, using wire connectors and sealing cement in accordance with manufacturer's recommendations.
- 7. Provide water tight splice connections to prevent leakage of voltage and corrosion build-up at the splice.

E. Backflow preventer:

- 1. Install in location indicted on Contractor's Design Drawing, and as approved by Contracting Officer. Coordinate location with other proposed improvements such as screen planting or other landscape work.
- 2. Install protective cover, in approved dark color. Secure cover at ground level in a manner acceptable to the Contracting Officer.

F. Water Line Tap and Water Meter:

1. Install water meter in location on Contractor's Design Drawing, including connection to water line. Reimburse local utility for all costs and fees.

G. Flushing, testing, and adjustment:

- 1. After sprinkler piping and risers are installed and before sprinkler heads are installed, open control valves and flush out system with full head of water.
- 2. Perform system testing upon completion of entire main line. Make necessary repairs and retest repaired sections as required. System shall evidence no leakage or pressure loss during a one hour, 100 PSI pressure test, in presence of Contracting Officer. Submit written documentation of time, date, ad results of pressure test to Contracting Officer.
- 3. Adjust sprinklers after installation for proper and adequate distribution of the water over the coverage pattern. Adjust for the proper arc of coverage.
- 4. Tighten nozzles on spray type sprinklers after installation. Adjust sprinkler-adjusting screw on lateral line or circuit as required for proper radius. Interchange nozzle patterns as directed by the Contracting Officer, to give best arc of coverage.
- 5. Adjust all electric remote control valve pressure regulators and flow control stems for system balance and optimum performance.
- 6. Test and demonstrate the controller by operating appropriate day, hour, and station selection features as required to automatically start and shut down irrigation cycles to accommodate plant requirements and weather conditions.

3-05 SPARE PARTS

A. Not required in this Contract.

3-06 DISPOSAL OF WASTE MATERIAL

- A. Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rock, trash, and debris.
- B. Maintain disposal route clear, clean, and free of debris.

3-07 ACCEPTANCE

- A. Test and demonstrate to the Contracting Officer the satisfactory operation of the system, free of leaks.
- B. Instruct the Owner's designated personnel in the operation of the system, including adjustment of sprinklers, controller(s), and valves, as well as winterization procedure. Submit written instructions to the Contracting Officer on operating and maintenance procedures.
 - 1. Ensure that zone numbers on controller(s) correspond with zone numbers on Contractor's Design Drawing, and are in logical clockwise order as approved by Contracting Officer.

3.08 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting form irrigation system installation.

DIVISION 2 - SITEWORK

SECTION 02830

CHAIN LINK FENCING AND GATES

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SECTION 02830

CHAIN LINK FENCING AND GATES

PART 1. GENERAL

1-01 SCOPE OF WORK: The work covered by this Section shall consist of furnishing all plant, labor, equipment, material, and performing all operations in connection with erecting the fencing, gate assemblies and appurtenances as detailed on the Drawings or specified herein.

1-02 DEFINITIONS:

- A. Type I: Type I Fencing is defined as chain link fencing with a barbed wire arm affixed to the top of each post and fitted with three (3) strands of barbed wire.
- B. Fence Height: The height specified on the Drawings or in the Contract Documents shall mean the height of the chain link fabric. If Type I fencing is specified, then the height of the barbed wire supporting arm and strands shall be in addition to the specified height of the fence.

1-03 QUALITY ASSURANCE

- A. Erector Qualifications: Erector must be a firm experienced in the erection of fencing of the type specified and approved by the manufacturer.
- B. Design Criteria: Comply with the standards of the Chain Link Fence Manufacturer's Institute for "Galvanized Steel Chain Link Fence Fabric" and Federal Specification RR-F-191/1A, unless otherwise shown or specified.
- C. Source Quality Control: Provide each type of fence and gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.
- D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
 - 1. ASTM A 120, Specification for Blank and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe of Ordinary Uses.
 - 2. ASTM A 153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. ASTM C 94, Ready-Mixed Concrete.
 - 4. ASTM F 552, Standard Definitions of Terms Relating to Chain Link Fencing.
 - 5. Chain Link Fence Manufacturers Institute, Galvanized Steel Chain-Link Fence Fabric.

- 6. Chain Link Fence Manufacturers Institute, Standard Guide for Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence Fabric.
- 7. Federal Specification, RR-F-191/1A, Fencing, Wire and Post, Metal (Chain-Link Fence Fabric).

1-04 SUBMITTALS

A. Samples: When requested, submit for approval, samples approximately 6 inches long, or 6 inch square of fabric material, framework members, and typical accessories. CONTRACTING OFFICER'S review will be for color and texture only. Compliance with all other requirements is the exclusive responsibility of CONTRACTOR.

B. Shop Drawings:

- 1. Submit for approval Shop Drawings for fences and gates, including plan layout and details illustrating fence height, location and sizes of posts, rails, braces, gates, and footings, hardware list and erection procedures.
- 2. Submit for approval copies of manufacturer's technical data test reports on physical properties, and installation instructions for steel fences and gates.

1-05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A Delivery of Materials: Deliver material in manufacturer's original packaging with all tags and labels intact and legible.
- B. Handling of Materials: Handle and store material in such manner as to avoid damage.

PART 2 - MATERIALS

2-01 GENERAL

- A. Pipe sizes specified are commercial pipe sizes.
- B. Tube sizes specified are nominal outside dimension.
- C. Roll-formed section sizes are the nominal outside dimensions.
- D. Finish for Framework and Appurtenances: Furnish the following finishes for steel framework and appurtenances:
 - 1. Galvanized finish with minimum weights of zinc as follows:
 - (a) Pipe: ASTM A 120, Schedule 40, 1.8 ounce zinc per square foot.

(b) Hardware and Accessories: ASTM A 153 zinc weight per Table I, Federal Specification RR-F-191/1A.

2-02 FABRIC

- A. Furnish chain link fabric as follows:
 - 1. One-piece fabric widths constructed of No. 9 gage wires.
 - 2. 2-inch mesh.
 - 3. Top and bottom selvages twisted and barbed.
 - 4. Galvanized finish with not less than .30 ounces zinc per square foot complying with ASTM A 392.
 - 5. Fabric Height: As shown on Drawings.

2-03 POSTS, RAILS AND BRACES

- A. End, Corner, and Pull Posts: Furnish end, corner, and pull posts of the minimum sizes and weights as follows;
 - 1. 6 feet fabric height: 2.875 inches O.D. pipe weighing 4.64 or greater pounds per linear foot.
- B. Line Posts: Furnish line posts of the minimum sizes and weights as follows: Space posts 10 feet on centers maximum.
 - 1. 6 feet fabric height: 2.375 inches O.D. pipe weighing 3.12 or greater pounds per linear foot.
- C. Gate Posts: Furnish gate posts for supporting each leaf of the double gate installation as follows: for gates twelve (12) to eighteen (18) feet in width, use 6.625 inch O.D. pipe weighing 18.02 or greater pounds per linear foot. For gates six (6) feet in width, use 2.875 inch O.D. pipe weighing 4.64 or greater pounds per linear foot.
- D. Top Rail: Furnish top rails of the following:
 - 1. 1.660 inch O.D. pipe weighing 1.83 pounds per linear foot.
 - 2. Furnish in manufacturer's longest lengths, but not less than 18 feet, with expansion type couplings, approximately 6 inches long, for each joint. Provide means for attaching the top rail securely to each gate, corner, pull, and end post. Ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding 24 inches.
- E. Tension Wire: Furnish tension wire consisting of galvanized 7 gage coiled spring wire. Locate at bottom of fabric only.
- F. Barbed Wire Supporting Arms: Furnish pressed steel, wrought iron, or malleable iron barbed wire supporting arms, complete with provisions for anchorage to posts attaching

- 3 rows of barbed wire to each arm. Supporting arms shall be integral with post top weather cap. Provide single 45 degree arm, one for each post where shown.
- G. Barbed Wire: 3 strand, 11 gage wire with 14 gage, 4-point aluminum alloy barbs spaced 5 inches on center galvanized per manufacturer's standards.
- H. Post Tops: Pressed steel, wrought iron, or malleable iron, designed as a weathertight closure cap, for tubular posts. Furnish one cap for each post unless equal protection is afforded by combination post top cap and barbed wire supporting arm, where barbed wire is required. Furnish caps with openings to permit through passage of the top rail.
- I. Stretcher Bars: One piece lengths equal to full height of fabric, with a minimum cross-section of ³/₁₆ inch by ³/₄ inch. Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into the post.
- J. Stretcher Bar Bands: Steel, wrought iron or malleable iron, spaced not over 15 inches on center to secure stretcher bars to end, corner, pull, and gate posts. Bands may also be used with special fittings for securing rails to end, corner, pull and gate posts.

2-04 GATES

- A. Fabricate gate perimeter frames of tubular members. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware and accessories. Space so that frame members are not more than 8 feet apart. Fabricate as follows:
 - 1. 1.90 inch O.D pipe weighing 2.25 pounds per linear foot.
- B. Assemble gate frames by butt welding for rigid connections. Use same fabric as for fence. Install fabric with stretcher bars at vertical edges. Bars may also be used at top and bottom edges. Attach stretchers to gate frame at not more than 15 inches on center. Attach hardware with rivets or by other means which will provide security against removal or breakage.
- C. Install diagonal cross-bracing consisting of 3/8 inch diameter adjustable length truss rods on gates where necessary to ensure frame rigidity without sag or twist.
 - 1. Where barbed wire is shown above gates, extend the end members of gate frames 1 foot-0 inch above the top member and prepare to receive 3 strands of wire. Provide necessary clips for securing wire to extensions.
- D. Gate Hardware: Furnish the following hardware and accessories for each gate.
 - 1. Hinges: Pressed or forged steel or malleable iron to suit gate size, non-lift-off type, offset to permit 180 degrees gate opening. Provide 1½ pair of hinges of reach leaf over 6 feet nominal height.

- 2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
- 3. Keeper: Provide keeper of all vehicle gates, which automatically engages the gate leaf and holds it in the open position until manually released.
- 4. Double Gates: Provide gate stops for double gates, consisting of mushroom type or flush plate with anchors. Set in concrete to engage the center drop rod or plunger bar. Include locking device and padlock eyes as an integral part of the latch, using one padlock for locking both gate leaves.

2-05 MISCELLANEOUS MATERIALS AND ACCESSORIES:

- A. Wire Ties: For tying fabric to line posts, use 9-gage wire ties spaced 12 inches on center. For tying fabric to rails and braces, use 9 gage wire ties spaced 24 inches on center. For tying fabric to tension wire, use 11 gage hog rings spaced 24 inches on center. Finish of ties to match fabric finish.
 - 1. Manufacturer's standard procedure will be accepted if of equal strength and durability.
- B. Concrete: Refer to ASTM C 94, Ready-Mixed Concrete.

PART 3 - CONSTRUCTION REQUIREMENTS

- 3-01 INSPECTION: CONTRACTOR and his installer must examine the conditions under which the fence and gates are to be installed and notify the CONTRACTING OFFICER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the CONTRACTING OFFICER.
- 3-02 PREPARATION: Do not begin fence installation and erection before the final grading is completed, with finish elevations established.

3-03 INSTALLATION

- A. Excavation: Drill holes of diameters and spacings shown, for post footings in firm, undisturbed or compacted soil.
 - 1. If not shown on the Drawings, excavate holes to the minimum diameters as recommended by fence manufacturer.
 - 2. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than the post bottom with bottom of posts set not less than 36 inches below the surface when in firm, undisturbed soil.
 - a. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site, as directed.

- B. Setting Posts: Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
 - 1. Center and align posts in holes 3 inches above bottom of excavation.
 - 2. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - 3. Trowel finish tops of footings, and slope or dome to direct water away from posts. Extend footings for gate posts to the underside of bottom hinge. Set keeps, stops, sleeves and other accessories into concrete as required.
- C. Concrete Strength: Allow concrete to attain at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than 7 days after placement, before rails, tension wires, barbed wire, or fabric in installed. Do not stretch and tension fabric and wires, and do not hang gates until the concrete has attached its full design strength.
- D. Top Rails: Run rail continuously through post caps or extension arms. Provide expansion couplings as recommended by fencing manufacturer.
- E. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install tension wires at bottom of fencing by weaving through the fabric and tying each post with not less than 6-gage galvanized wire, or by securing the wire to the fabric.
- G. Fabric: Leave approximately 2 inches between finish grade and bottom selvage, except where bottom of fabric extends into concrete. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- H. Stretcher Bars: Thread through or clamp to fabric 4 inches on center, and secure to posts with metal bands spaced 15 inches on center.
- I. Barbed Wire: Install 3 parallel wires on each extension arm; on security side of fence, unless otherwise indicated. Pull wire taut and fasten securely to each extension arm.
- J. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.
- K. Tie Wires: Use U-shaped wires conforming to diameter of pipe. Clasp pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.

L. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3-04 ADJUSTMENT AND CLEANING

- A. Adjust all fencing and gates and leave in good working condition.
- B. Repair or replace any broken or bent components as directed by the Contracting Officer.
- C. Protect gates and fencing from construction traffic until acceptance of the Work.
- D. Repair coatings damaged in the shop or during field erection by recoating with manufacturer's recommended repair compound, applied per manufacturer's direction.

DIVISION 3 – CONCRETE

SECTION 03100

CONCRETE FORMWORK

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SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1-01 DESCRIPTION

A. Formwork for cast-in-place concrete, complete with shoring, bracing and anchorage.

1-02 SPECIFICATION STANDARDS

- A. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this section where cited by abbreviations noted below.
 - 1. ACI 347 "Recommended Practice for Concrete Formwork".
 - 2. ACI 301 "Specifications for Structural Concrete".

1-03 SPECIAL REQUIREMENTS

- A. The General contractor shall lay out and mark the location of all walls and partitions so that mechanical and electrical conduits, inserts and sleeves will be properly located.
- B. Contractor is cautioned that all exposed concrete work is to be carefully finished and exposed corners or edges must be sharp and clean. Warps and discoloration on surface will not be accepted.

1-04 SUBMITTALS

- A. Manufacturer's literature describing products.
- B. Samples: Only as requested.

PART 2 PRODUCTS

2-01 GENERAL

- A. Form Design and Shoring: The design and engineering of the formwork and shoring, as well as its construction and installation, shall be the responsibility of the Contractor. Formwork shall be designed for loads and lateral pressures outlined in ACI 347 and wind loads as required by the applicable controlling building codes. Design considerations, allowable stresses and other applicable requirements shall conform to ACI 347 and the controlling local building code.
- B. Allowable Tolerances: Formwork shall produce concrete within the following tolerance limits unless otherwise noted.
 - 1. Tolerances for formed surfaces for buildings shall conform to ACI 301.

- 2. Tolerances for elevator shafts shall be as required by ANSI/ASME Safety Code for Escalators and Elevators.
- 3. Tolerances for formed surfaces for all other concrete structures shall conform to those outlined in ACI 347, unless otherwise noted.
- C. Cooperation: Fully cooperate with other trades and other sections for the installation of embedded items. Provide suitable templates, inserts, and sleeves for setting items not placed in the forms.

2-02 MATERIALS

- A. Forms shall be plywood, metal, fiber glass, and/or lumber, as specified below. Form materials furnished shall be new, except that metal and fiber glass forms previously used elsewhere will be permitted, provided that they are free of objectionable holes, dents, distortions, and other defects. After initial use on this project, form materials may be reused thereon provided they will produce acceptable concrete surfaces.
 - 1. Forms for round columns shall be spirally constructed of laminated plies of fiber similar to Sonotube Fiber Forms manufactured by Sonoco Products Company, or an approved equal.
 - 2. Framing, backing, bracing, shoring, and other formwork shall be No. 2 Common or better lumber.
 - 3. Smooth surface forms shall be used for all exterior and interior exposed concrete surfaces including, but not limited to, walls, columns, ceilings, beams, steps, tank and basin interiors, and slab edges and be moisture resistant commercial standard Douglas fir concrete form type plywood, at least five ply, bearing APA grade trademark, unless otherwise approved.
 - 4. Unfinished surface forms may be used for all exterior and interior concealed concrete, except tank and basin interiors, and may be No. 2 Common or better lumber, metal or other type of form material except that wood forms shall be used for all surfaces that are to be plastered.
 - 5. Earth forms may be used as side forms of footings where soil conditions are suitable and approved by the Contracting Officer.
- B. Form Ties shall be of the snap tie type which can be removed to at least 1-1/2 inches below concrete surfaces leaving an opening no larger than the tie rod diameter, without cones.
 - 1. Provide ties with integral water stops for all structures which are intended to contain water or other liquid and/or to prevent intrusion of ground or other water.
- C. Form sealer shall be non-staining mineral oil or other approved coating.

- 1. Form release agent for surfaces intended to receive an applied coating or finish must be compatible with the applied coating or finish.
- 2. Form coating for potable water containing structures shall be non-toxic after 30 days and not introduce objectionable taste or odor into the water.

PART 3 EXECUTION

3-01 CONSTRUCTION

- A. Construct and erect forms to types, shapes, lines, and grades shown on the drawings with as few joints as practical to insure straight, plumb, level, and smooth concrete surfaces with all angles sharp and true to line and to facilitate safe form removal without damage to concrete. Forms shall have sufficient strength to safely support all construction loads, with no appreciable bulging, sagging, movement, or leakage of mortar, and be clean of all debris at time of concreting.
- B. Camber forms where necessary to maintain specified tolerances.
- C. Provide 3/4 by 3/4 inch chamfer strips, unless noted otherwise, in formwork at exposed external corners, including but not limited to those on columns, beams, walls, slab edges, and equipment bases, but not including those on steps.
- D. Bevel, marker and rustication strips shall be applied in straight lines and secured to prevent displacement.
- E. Provide temporary cleanouts and openings in wall and column forms as required for effective removal of loose dirt, debris, and waste material; for inspection of reinforcement; for introduction of vibrators; and where necessary to limit the free fall of the concrete to less than four feet.

F. Slab Forms:

- 1. Establish levels and set screeds.
- 2. Depress slabs where required to receive special floor finishes.
- 3. Slope to drain where required or shown or noted.
- G. Earth forms for footings shall be cut to sizes and elevations indicated. If dry, all earth or rock surfaces shall be moistened prior to concrete placement.
 - 1. Provide forms for footings wherever concrete cannot be placed against solid earth excavation.

H. Contact face of forms shall be coated with approved coating; or wood forms may be thoroughly wetted except in freezing weather. Oil coating must be applied and excess wiped off before placing reinforcement.

3-02 OPENINGS IN CONCRETE CONSTRUCTION

- A. Formed Openings: Provide these where required for mechanical, electrical, and other work.
- B. Cutting Openings: Where openings are required in new in-place or existing concrete construction, cut these only at locations approved by the Contracting Officer:
 - 1. Small opening for pipes, conduits, etc.: cut these with suitable rotary core type drills, without spalling the concrete; do not use star drills, chisels, or similar impact type tools, unless otherwise approved.
 - 2. Large holes for ducts, equipment, doorways, windows, etc.: chip these through the concrete one-half way through each side, to prevent unnecessary spalling and damage to the concrete.

3-03 REMOVAL OF FORMS

A. Remove forms only with approval, and in a manner that will insure complete safety of the structures. Where the structure as a whole is supported by shores, the forms for beam and girder sides, columns, and similar vertical surfaces may be removed after 24 hours, provided that the concrete has hardened sufficiently to prevent its injury by form removal. Do not in any case remove supporting forms or shoring until the structural members have acquired sufficient strength to safely support their weight and the load which will be placed thereon. Use every precaution to avoid spalling or otherwise damaging concrete by form removal.

3-04 INSERTS AND FASTENING DEVICES FOR OTHER WORK

- A. Provide for installation of inserts, hangars, metal ties, anchors, bolts, dowels, nailing strips, grounds, and other fastening devices required for attachment of other work.
- B. Other metal items embedded in concrete work are specified under other Divisions of these Specifications. Check Drawings and Specifications carefully for items embedded in concrete work prior to each pour.

DIVISION 3 – CONCRETE

SECTION 03200

CONCRETE REINFORCEMENT

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SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1-01 DESCRIPTION

A. The work required under this Section consists of Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete, complete with tie wire, bar supports, splices and other reinforcing devices.

1-02 SPECIFICATION STANDARDS

- A. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work in this section where cited below:
 - 1. ASTM American Society for Testing and Materials.
 - 2. ACI American Concrete Institute's.
 - 1. ACI 315 "Details and Detailing of Concrete Reinforcement."
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete."
 - 3. CRSI Concrete Reinforcing Steel Institute's.
 - 1. CRSI "Manual of Standard Practice."
 - 2. CRSI "Reinforcing Bar Splices."
 - 3. CRSI "Placing Reinforcing Bars."

1-03 SUBMITTALS

- A. Manufacturer's literature describing products, if requested.
- B. Shop Drawings: Show bending and placing details, size, and location of reinforcing steel. Include diagrammatic wall elevations at scale to show clearly position and erection marks of bars including marginal bars around openings with dowels, splices, etc. in accordance with ACI 315 and CRSI Manual of Standard Practice.
- C. Certified Mill Test Reports.
- D. Samples if required by Contracting Officer.

1-04 STORAGE AND HANDLING

- A. Store reinforcing and accessories in manner to prevent rusting and fouling with grease, dirt, or other bond-weakening coatings.
- B. Take precautions to maintain identification after bundles are broken.

PART 2 PRODUCTS

2-01 REINFORCING STEEL

- A. All reinforcement shall be detailed and fabricated in accordance with ACI 315 and CRSI "Manual of Standard Practice."
- B. Reinforcing bars, except column spirals shall be deformed bars conforming to ASTM A615 "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement," Grade 60 as indicated on the drawings.
- C. Spiral Reinforcement shall be plain bars conforming to ASTM A615, Grade 60; or plain cold drawn steel wire conforming to ASTM A82-85 with a minimum yield strength of 70,000 psi.
- D. Welded Wire Fabric shall conform to ASTM A185.

2-02 REINFORCING BAR SUPPORTS

- A. Bar supports shall be provided as recommended in Chapter 3 of CRSI "Manual of Standard Practice."
 - 1. All bar supports in contact with formwork for surfaces which will be exposed to view; be exposed to weather; receive acoustical plaster or paint; and interior surfaces of structures which will normally contain water: CRSI Class 1, plastic-protected, or CRSI Class 2, stainless steel protected, as approved.
 - 2. For other areas, unless otherwise indicated: CRSI Class 3, bright basic.
 - 3. On ground: concrete blocks, or if required, wire bars Class 3 with sand plates.
 - 4. Tie wire shall be black annealed wire, 16-1/2 gauge minimum.

PART 3 EXECUTION

3-01 PLACEMENT

- A. Place reinforcing steel in accordance with the recommended practices in "Placing Reinforcing Bars" by CRSI, as indicated on the drawings and outlined herein
- B. Do not bend or straighten any reinforcing steel in a manner which will weaken or damage the material, nor heat reinforcing steel for bending or straightening.

C. All splices of reinforcement, minimum concrete cover, placing tolerances and bar spacings shall conform to ACI 318 and to recommended practices in "Reinforcement Anchorages and Splices" by CRSI.

3-02 SUPPORTS

- A. Reinforcing steel shall be accurately placed, in the forms adequately supported and secured against displacement within the tolerances outlined in ACI 318.
- B. Provide spaces, chains, bolsters, and other metal accessories to support all reinforcing steel and secure it in proper position before and during concrete placement.
- C. Splices shall be as indicated on the drawings. Generally splice bottom bars at points of support and top bars at mid-span of slabs, beams, and girders. Avoid splices at points of maximum tensile stress. Stagger horizontal and vertical splices.
- D. Reinforcing steel shall not be welded.

3-03 PROTECTION AGAINST RUST

- A. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
- B. Remove protective materials and clean reinforcement as required before preceding with concrete placement.
- C. Prior to concrete placement, verify reinforcement has been properly bent, positioned, and secured in accordance with drawings; and remove ice, oil, grease, dirt, or other bond-weakening coatings.

3-04 INSPECTION

A. Reinforcing for any pour shall be completely placed and inspected by the Contracting Officer prior to staring the pour.

DIVISION 3 - CONCRETE

SECTION 03300

CAST IN PLACE CONCRETE

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1-01 SECTION INCLUDES

A. Cast-in-place concrete joints, expansion joint fillers, water stops, and anchorage items including slots, inserts, anchors, and bolts etc. for sanitary sewer structures and buildings.

1-02 RELATED SECTIONS

- A. Section 02200 Earthwork.
- B. Section 03100 Concrete Formwork.
- C. Section 03200 Concrete Reinforcement.

1-03 REFERENCE STANDARDS AND CODES

- A. Published Specifications, standards, tests, or recommended methods of trade, industry or governmental organizations apply to work in this section where cited below:
 - 1. ASTM American Society for Testing and Materials.
 - 2. ACI American Concrete Institute's.
 - 3. FS Federal Specifications.
- B. Materials and work shall conform to the requirements of standards, codes, and recommended practices required in this section. In conflicts between industry standards, required standards and this specification, or this specification and the local building code, the more stringent requirement shall govern.
 - 1. Applicable Standards and Codes:
 - a. ACI 301 "Specifications for Structural Concrete for Buildings."
 - b. ACI 318 "Building Code Requirement for Reinforced Concrete."
 - c. ASTM C94 "Standard Specification for Ready-Mixed Concrete."

1-04 QUALITY ASSURANCE

A. Concrete work shall conform to all requirements of ACI 301 "Specifications for Structural Concrete for Buildings", except as modified and supplemented herein.

1-05 SUBMITTALS

- A. Manufacturer's literature describing products.
- B. Contractor shall prepare and submit for approval preliminary mix design for each class of concrete specified a minimum of 14 days prior to concrete production.
- C. Contractor shall name his source of supply for concrete materials and submit representative samples of aggregates and cement and reports of quality tests for approval.
- D. Other samples only as requested.

1-06 STORAGE OF MATERIALS

A. Store concrete materials in a manner which will effectively segregate each type of material from each other, prevent contamination of materials, and protect the materials from damage by weather and other causes.

1-07 INSPECTION AND TESTING

- A. The Contracting Officer and testing laboratory shall have free access to all points where concrete materials are stored, proportioned or mixed, and all materials, equipment and methods used shall be subject to their inspection, tests, and approval.
- B. A Corps of Engineer's certified testing laboratory shall perform following services:
 - 1. Test of Portland Cement, one test for each separate carload or certified mill test reports of cement.
 - 2. Test gradation of coarse and fine aggregates.
 - 3. Design and test all mixtures (with admixtures included) to be used on project.
 - 4. If concrete materials are batched away from the project site and mixed on the project or transported to project in mixer or agitator trucks, laboratory inspection shall be provided at job site for checking materials deliveries and concrete consistencies on all pours in excess of 24 cubic yards and on others if required by the Contracting Officer.
 - 5. Cast, cure, and test cylinders of the concrete actually placed on the job, all in accordance with ASTM C31 and ASTM C39, and as follows:
 - a. Quantity of test cylinders required: at least four cylinders of each day's concrete placing, but not less than four cylinders for each 100 cubic yards of concrete placed, and not less than four cylinders for each 5,000 square feet of surface area of concrete placed.
 - b. Testing requirements: test one laboratory and one field cured cylinder at

seven days; test one laboratory and one field cured cylinder at 28 days.

- 6. Slump tests, using ASTM C143, of concrete sample for each strength test and whenever in the Contracting Officer's opinion consistency of concrete appears to vary.
- 7. Test for air content of normal weight concrete sample for each cylinder in accordance with ASTM C173.
- 8. Test for air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567
- 9. Determine temperature of concrete sample for each strength test.
- 10. Test reports shall be promptly furnished by the laboratory to the Contractor and the Contracting Officer.
- 11. Daily reports of pouring shall be furnished, giving the date, location, and yardage of pour, specifying materials, proportions, consistencies and class of concrete used, the test cylinder number representing pour, and the weather conditions prevailing.

PART 2 PRODUCTS

2-01 MATERIALS

- A. Cement: ASTM C150, Type I or Type II, unless otherwise approved. Use only one brand of cement throughout the project unless otherwise approved by the Contracting Officer. All cement shall have a maximum of 8 percent tre-calcium aluminate.
- B. Aggregates for normal weight concrete shall conform to ASTM C33:
 - 1. Coarse aggregate: crushed limestone/clean natural gravel. Maximum size ¾ inch.
 - 2. Fine aggregate: clean, natural sand.
- C. Aggregates for lightweight concrete shall be expanded shale type conforming to ASTM 330.
 - 1. Coarse aggregates: uniformly graded from ¾ inches to No. 4.
 - 2. Fine aggregates: a blend of lightweight fines, ASTM C330and natural sand, ASTM C33.
- D. Water: Clean and potable, free from impurities detrimental to concrete.
- E. Admixtures: Use only when conditions of use are approved, or as specified elsewhere in these specifications.

- 1. Water reducing admixture: The admixture shall conform to ASTM C494, Type A, and not contain more chloride ions than are present in municipal drinking water.
- 2. Water reducing, retarding admixture: The admixture shall conform to ASTM C494, Type D, and not contain more chloride ions than are present in municipal drinking water.
- 3. High range water reducing admixture (superplasticizer): The admixture shall conform to ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
- 4. Non-Corrosive, Non-Chloride Accelerator: The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride irons than are present in municipal drinking water. The admixture manufacturer must have long term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
- 5. Air Entraining Admixture: Conform to ASTM C260.
- 6. Calcium Chloride: Calcium chloride, thicyanates or admixtures containing more than 0.05 percent chloride ions are <u>not</u> permitted.
- 7. Certification: Written conformance to above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Contracting Officer.
- F. Bonding Compound: The compound shall be a polyvinyl acetate, rewettable type.
- G. Epoxy Adhesive: The compound shall be a two component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces.
- H. Non-Shrink Non-Metallic Grout: Factory premixed grout containing mineral aggregates and requiring only addition of water at the site. The grout shall conform to CRD-621, "Corps of Engineers Specifications for Non-Shrink Grout".

I. Curing Materials:

- 1. Waterproof Paper: ASTM C171, Type 1, regular.
- 2. Sheet Plastic: Polyethylene, 4 mils thick, fungus resistant.
- J. Curing and Sealing Compound: The Compound shall conform to Federal Specification TT-C-800A, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per square cm. when applied at a coverage rate of 300 square feet per gallon. Manufacturer's certification required.

- K. Dissipating Resin Curing Compound: The compound shall be a dissipating resin type compound, conforming to ASTM C309, Type I. The film must chemically break down in a two to four week period after application.
 - 1. Curing compounds shall not be used on any surface against which additional concrete or other cementitious materials are to be bonded.

L. Expansion Joint Fillers:

- 1. ASTM D1751 "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)."
- 2. ASTM D1752 "Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction."
- 3. Verify compatibility of joint filler with sealant specified.
- M. Joint Sealant: Joint sealants shall be of high quality material similar to Precora Corporation's Synthacalk→ GC-2+or approved equal. All joint surfaces shall receive a prime coat of Precora Corporation's Synthacalk→ P-53+ or approved equal.
- N. Anchorage Items: Cast-in-place slots, bolts, and inserts for anchoring masonry finish and mechanical items to concrete shall be of the types indicated and/or required to accommodate the subsequently installed fastening devices.
- O. Vapor Barrier: 10 mil (1.0 mm thick) clear polyethylene film, type recommended for below grade application.
- P. Waterproofing. A rubberized asphalt sheet membrane waterproofing shall be applied to all exterior walls of the influent junction box and influent pump station.
- Q. Waterstop. Waterstops shall be of the sizes indicated on the plans.
- R. Non-Slip Aggregate. Aluminum oxide type.

2-02 PROPORTIONING

- A. Proportioning of ingredients for each class of concrete required shall be in accordance with ACI 301 Method 1, laboratory trial batches, or Method 2, past field experience using materials to be employed on the project to produce placability, durability, specified strengths and properties specified.
 - 1. This section shall propose mix designs prepared in accordance with Method 1 (trial batches) or Method 2 (field experience) of ACI 301.
 - 2. If trial batches are used, this section shall instruct Laboratory to base mix designs on use of materials tested and approved by the Testing Agency.

2-03 CONCRETE QUALITIES REQUIRED

- A. Strength: Specified compressive strength at 28 days shall be 4,000 psi.
 - 1. Average strength shall exceed specified compressive strength as required in accordance with ACI 318.
- B. Water-Cement Ratio: All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.40 by weight. All concrete subjected to deicers and/or required to be watertight shall have a maximum water-cement ratio of 0.45.

C. Minimum Cement Content:

- 1. 5-1/2 sacks per cubic yard for coarse aggregate size No.467 (1-1/2 maximum).
- 2. Six sacks per cubic yard for coarse aggregate size No. 57 (one inch maximum) or No. 67 (3/4 inch maximum).
- D. Air Content: All concrete subjected to freezing and thawing after curing and/or required to be watertight shall be air entrained. Total air content as determined in accordance with ASTM C173 shall be:
 - 1. 5 (± 1) percent for coarse aggregate size No. 467 (1-1/2 inch maximum).
 - 2. 6 (±1) percent for coarse aggregate size No. 57 (one inch maximum) or No. 67 (3/4 inch maximum).
 - 3. All interior slabs to receive a surface hardener or subject to abrasion shall have a maximum total air content of three percent.
- E. Slump: As determined by ASTM C143 for concrete to be vibrated:
 - 1. Slabs and walls: four inches maximum, two inches minimum.

F. Lightweight Structural Concrete:

- 1. Lightweight concrete shall have a minimum compressive strength of 3,000 psi at 28 days as noted on the drawings. Maximum air dry unit weight shall be 110 pounds per cubic foot. Minimum cement factor shall be 6.2 sacks per cubic yard, unless otherwise approved.
- 2. Lightweight concrete shall be air entrained and contain six percent plus or minus one percent total air as determined by ASTM C231.
- 3. Lightweight concrete shall otherwise conform to requirements of normal weight concrete.

PART 3 EXECUTION

3-01 PRODUCTION OF CONCRETE

- A. Concrete shall be ready-mixed, batched, mixed, and transported in accordance with ASTM C94, "Standard Specification for Ready-Mixed Concrete."
 - 1. Plant equipment and facilities shall conform to "Certification of Ready Mixed Concrete Production Facilities (Checklist with Instructions)" of the National Ready Mixed Concrete Association.

3-02 PREPARATION

- A. Approval: Prior to placing concrete, give the Contracting Officer sufficient advance notice of each proposed placing. Do not place any concrete on any subgrade or in any formwork until the subgrade, formwork, reinforcing steel, anchor bolts, and other embedded items for the placement involved have been inspected and approved by the Contracting Officer.
- B. Bonding and Grouting: Before depositing new concrete on or against concrete which has set, treat existing concrete surfaces which will receive additional concrete, as follows: thoroughly roughen existing concrete surfaces and remove laitance, foreign matter, and loose particles; retighten forms at junction of existing and new concrete; dampen (but do not saturate) existing concrete surfaces; and slush existing concrete surface with cement-sand grout of proportions similar to those of the concrete. Grout coat shall be as thick and practicable on vertical surfaces, and at least 1/2 inch thick on horizontal surfaces. Place new concrete before grout has attained its initial set.
- C. Install construction joints at locations indicated on drawings. Except where indicated, no construction joints will be permitted without prior specific approval. Vertical construction joints in wall footings shall be reduced to a minimum. Construction joints in slabs and walls, where permitted, shall be located and made so that the strength and usefulness of the structure will not be impaired. Except where shown otherwise, provide keyways at all construction joints as indicated on the plans. Metal keyways are not permissible.
 - 1. Unless otherwise indicated, the spacing of the joints shall not exceed the following in any horizontal direction: suspended slabs, 20 feet; other slabs on grade, 50 feet; walls, 50 feet.
- D. Expansion joints shall be provided at locations indicated on drawings. Joint filler shall be as specified. Do not permit reinforcement or other embedded metal items bonded to concrete (except dowels bonded on only one side of joint) to extend through any expansion joint.
- E. Contraction joints shall be formed in walls with removable strips placed in the forms and in slabs with an early entry dry cut system, both to the depth indicated on the plans.
 - 1. Contraction joints may be formed, tooled or sawed approximately equal to 1/4 the thickness of slab.

- 2. The spacing of the joints shall be as shown on the drawings.
- 3. All joints shall be sealed with a joint sealant as specified herein.
- F. Placing Embedded Items: Expansion joint material, waterstops and other embedded items shall be positioned accurately and securely against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent entry of concrete into voids.
- G. Anchor bolts shall be set with templates according to approved shop drawings.
- H. Slabs on grade shall be placed on properly leveled and thoroughly compacted subgrades or granular fill, as indicated. All sub-soils for slabs shall be approved before placing concrete. At locations indicated provide one layer of vapor barrier material, lapped at joints a minimum of 24" inches.
- I. Except where shown otherwise, chamfer all exposed concrete edges ¾".
- J. Install waterstops in all expansion joints, construction joints and control joints in each structure designed to contain water or other liquid, or designed to prevent intrusion of water or other liquid, as indicated and/or as required to provide watertight structures. Arrange all waterstops to provide continuous seals in all joints between the separate concrete placements in each structure. Carefully fit all waterstops to form turns, tees, crosses, and other arrangements as required to provide a complete, continuous water seal in all joints subject to leakage. Heat weld all joints in waterstops, and install as recommended by the manufacturer.
 - 1. Waterstop shall be securely held in position so that it will not be displaced during concreting. Exercise care to avoid contamination of waterstop surface by form coatings or other substances which would adversely affect bonding.
- K. Concrete Foundations for Mechanical and Electrical Equipment: Provide concrete pads required under all mechanical equipment. Set bolts, anchors, piping, etc., in concrete as required by manufacturer of equipment used. See mechanical and electrical drawings and details for size, design, and location of equipment requiring concrete pads. Pads shall be trowel finished on all top exposed surfaces.

3-03 PLACEMENT

- A. Conveying: Convey concrete from mixer to forms as rapidly as practicable without segregation or loss of ingredients, continuously and at such a rate that no unfinished area will be left exposed or unworked before the concrete takes its initial set. Do not deposit concrete initially set. Cast concrete within one hour after adding water unless otherwise noted. Retempering of concrete which has partially set will not be permitted.
- B. Take precautions to avoid damage to under-slab waterproofing and displacement of reinforcement and formwork.

- C. Chute Placement: When concrete is conveyed by chute, maintain a continuous flow of concrete. Chute shall be of metal or metal-lined wood, with sections set at approximately the same slope, which shall not be less than one vertical to three horizontal, and not more than one vertical to two horizontal. Discharge end of chute shall be provided with a drop chute to prevent segregation. If height of discharge end of chute is more than three times the thickness of the layer being deposited, but not more than four feet above surface of concrete in forms, use a spout with its lower end maintained as near surface of deposit as practicable. When pouring is intermittent, chute shall discharge into a hopper. Clean chutes thoroughly before and after each run. Discharge waste materials and flushing water outside forms. Raised runways for wheeling concrete to place shall be provided when necessary.
- D. Deposit concrete in approximately horizontal layers of 12 to 18 inches as near as possible to its final position. Do not allow concrete to drop vertically more than 3 or 4 feet, nor through a cage of reinforcing steel except when an elephant trunk or tremie is used.
 - 1. Elephant trunks or tremies shall be used in deep walls and columns to prevent free fall of concrete and to allow placement through cage of reinforcement.
- E. Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before casting next lift. Also remove leakage or laitanance through forms.
- F. Interruption in casting longer than 45 minutes shall be cause for discontinuing casting for remainder of day. In this event, cut back concrete and provide construction joints as the Contracting Officer directs; clean forms and reinforcement as necessary to receive concrete at later time.
- G. Continuously place concrete in units between construction joints so that each unit will be monolithic in construction. Concrete placement rate shall be such that surface of concrete not carried to construction joints will not have attained initial set before additional concrete is placed in the construction unit involved. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at same time as slabs. In walls of structures having door, window, or other openings, lifts of individual pours shall terminate at the tops or bottoms of the openings. Other lifts shall terminate at levels indicated, or to conform to structural requirements or architectural details, or both, as approved. Special provisions shall be made for joining successive pours as detailed or as approved. At least 48 hours shall elapse before placing concrete in the adjoining unit at each construction joint.
- H. Compaction: During and immediately after depositing concrete compact each layer by mechanical internal vibrating equipment supplemented by hand spading, rodding, and tamping, as required. Do not use vibrators to transport concrete inside of forms. Form vibrators shall not be used. Internal vibrators shall maintain not less than 5,000 impulses per minute when submerged in the concrete; maintain at least one vibrator as a stand-by. Limit vibrator duration to the time necessary to produce satisfactory consolidation without causing objectionable segregation. Do not insert vibrator into lower courses which have begun to set. Apply vibrators at uniformly spaced points not farther than the visible effectiveness of the machine. Vibrate thoroughly all concrete at

all waterstops to insure their complete embedment in solid concrete.

- I. Hot Weather Concreting: Conform to ACI 305R and following requirements when mean daily temperature rises above 85 degrees Fahrenheit.
 - 1. Temperature of concrete as placed shall be lowest temperature practicable but not higher than 85 degrees Fahrenheit, unless approved otherwise by the Contracting Officer.
 - 2. Crushed ice in lieu of water will be approved to maintain concrete below maximum temperature.
 - 3. Addition of water-reducing retarders will be permitted only if the Contracting Officer approves and mix is redesigned.
 - 4. Concrete shall be discharged within 45 minutes after adding water.
- J. Cold Weather Concreting: Conform to ACI 306R and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.
 - 1. Reinforcement, forms, or ground to receive concrete shall be completely free from frost.
 - 2. Minimum temperature of concrete as placed shall be 50 degrees Fahrenheit.
 - 3. Concrete shall be maintained at temperature no lower than 50 degrees Fahrenheit for minimum seven day period after placement.
 - 4. Only the specified non-corrosive, non-chloride accelerator may be used. Calcium chloride, thicyanates, or admixtures containing more than 0.05 percent chloride ions are <u>not</u> permitted.

3-04 REPAIR OF SURFACE DEFECTS

- A. Fin and Protrusion Removal: Immediately after form removal, remove fins and other unnecessary protrusions, flush with concrete surfaces.
- B. Filling and Patching: Surface defects including tie holes, shall be repaired immediately after form removal using one of the following appropriate methods.
 - 1. For concrete surfaces to receive rubbed finish: as soon as practicable after form removal, fill and patch tie holes, honeycombs, voids, and other unnecessary holes, as follows:
 - a. Remove all loose material.
 - b. Wet concrete for 8 hours before patching.
 - c. Mop surface to receive patch, with slurry of cement and water.

- d. Fill with "dry" grout of sand and cement in the same proportions as those of the concrete, except with only enough water added to provide a mix that will "ball" in the hand. Force grout into cavities with the greatest practicable pressure.
- e. Finish surface to match adjacent area.
- f. Cure fill as specified under curing.
- 2. For concrete surfaces to receive waterproof coating and finish: as soon as practicable after form removal, fill and patch tie holes, honeycombs, voids, and other unnecessary holes with commercially prepared patching material. Standard Dry Wall Products "Thorite" or as approved, which has high bonding characteristics; 5,000 psi minimum 28 day strength; recommended by the manufacturer for use in contact with potable water without emitting objectionable tastes or odors to the water; and compatible with the Waterproof Coating and Finish specified above. Apply patching material in strict accordance with the manufacturer's printed instructions. All surfaces shall be approved by the Contracting Officer prior to application of coatings.

3-05 FINISHING OF FORMED SURFACES

- A. Immediately after forms have been removed and concrete surfaces have been repaired as specified under "Repair of Surface Defects" concrete surfaces shall be given one or more of the following finished in locations indicated or specified hereinafter. When completed the finished exposed concrete surfaces shall be free of defects, with corners, jambs, rises, and angles straight, plumb, true to line, and level, as applicable.
- B. Rubbed Finish: Immediately after form removal, completely rub and finish the concrete surfaces with abrasive stones, as required to obtain uniform and approved surface texture and color.
- C. Related Unformed Surfaces: Tops of walls or buttresses, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and be floated to a texture reasonably consistent with that of the formed surfaces. Continue final finish on formed surfaces uniformly across the unformed surfaces.
- D. Waterproof Coating and Finish: Remove all form release products and membrane curing compounds and apply a waterproof coating. Coating shall be as recommended by the manufacturer for this application and shall bond securely to the concrete surfaces.
 - 1. Waterproof coating shall be Standard Dry Wall Products "Thoroseal" mixed with Acryl 60 bonding agent, or approved equal waterproof coating, applied in two coats in strict accordance with the manufacturer's printed instructions to produce a sand textured finish.

3-06 CONCRETE SLAB FINISHES

- A. General: Finish concrete slabs as specified below. Dusting of wearing surfaces with dry materials will not be permitted. In preparation for finishing, strike slabs off true to the required elevations and grades of the finished slabs. Slabs shall be level, except where drains occur or slopes are indicated, in which case the slabs shall be pitched to the drains or sloped, as applicable. Floors shall be flat and achieve a flatness, F_f of 25 as per ASTM E 1155. Floors shall be level and achieve a levelness, F_l of 15 as per ASTM E 1155.
- B. Wood Float Finish: Finish slabs by screeding and floating with straight edges to bring the surface to the required finished elevation. While the concrete is still green but sufficiently hard to bear a man's weight without deep imprint, wood float the surface to a true even plane with no coarse aggregate visible using sufficient pressure on the wood floats to bring moisture to the surface.
- C. Steel Trowel Finish: First wood float finish the slabs as specified in the paragraph above. Then hand finish the concrete with a steel trowel to produce a smooth impervious surface free from trowel marks.
- D. Machine Finish: Suitable machines may be used to finish the concrete, provided that they produce satisfactory final finishes at least equal to those normally obtained by the hand finishing methods specified above.
- E. Broom Finish. Finish concrete surface with wood float finish as specified above, then broom surface to provide a light grit finish. Broom finish is required on all exterior slabs, pavements and sidewalks.
- F. Roughened Finish: First wood finish the slab as specified above. Rake surface to provide a coarse finish with exposed aggregate of 1/2" maximum amplitude.

3-07 WATERTIGHTNESS OF CONCRETE STRUCTURES

- A. All concrete structures which are intended to contain water or other liquids and/or prevent entry of water into the structure, shall be strictly watertight.
- B. Promptly repair and permanently leakproof all cracks and other defects through which water or other liquids leak before and during the guarantee period, as approved.

3-08 CURING

- A. General: Take curing measures immediately after casting and extend period according to the Contracting Officer's recommendation based upon prevailing temperature, wind, and relative humidity.
 - 1. Keep concrete continuously moist for minimum 14 days after casting.
 - 2. Maintain concrete temperature at minimum 50 degrees Fahrenheit for seven days after casting.
 - 3. Avoid alternate wetting and drying and fluctuations of concrete temperature.

- 4. Protect fresh concrete from direct rays of sun, rain, drying winds, soiling, and damage.
- 5. Do not permit curing method to affect adversely finishes or treatments applied to finished concrete.
- B. Curing Methods for Slabs: Cure all concrete surfaces with one or a combination of the following methods. Where a specific curing procedure is not specified, at the Contractor's selection, one or more of the following methods shall be used.
 - 1. Water curing: keep concrete surfaces continuously wet with clean water during the curing period by immersion, maintaining a continuous flow of water over the surface, continuous spraying, continuous sprinkling or a combination of these. For all curing methods, the difference in temperature between the water used for curing and the concrete shall not exceed 20 degrees Fahrenheit.
 - 2. Wet coverings: cover the concrete surfaces with burlap, cotton mats, sand, earth, or other suitable moisture retaining materials and keep these materials saturated during the curing period. Lap all fabrics at least 8 inches at all joints. On exposed concrete, do not use any type covering which will discolor the concrete surface.
 - 3. Waterproof coverings: as soon as possible after finishing, thoroughly wet the concrete surfaces and cover the concrete surfaces with waterproof paper or plastic film immediately after wetting. For a period of at least 8 hours after the concrete has taken its initial set, maintain a continuous flow of clean water over the concrete surface under the covering. Lap all joints in the covering at least 8 inches and provide weights and other means and methods to keep the waterproof covering in direct contact with the concrete during the curing period.
 - 4. Membrane forming curing compounds: an approved liquid membrane forming curing compound may be used after one of the curing methods specified above has been used for at least 24 hours after the concrete has taken its initial set. The membrane forming curing compound shall be applied in strict accordance with the manufacturer's printed instructions. Apply in two coats at right angles to each other at a rate of 200 square feet coverage per gallon per coat unless otherwise recommended by the manufacturer. Apply coats uniformly and free of pinholes, gaps, puddles, and runs.
 - a. Membrane forming curing compound used on potable water containing structures shall be nontoxic and taste and odor free.
- C. Curing Methods for Walls: Cure all concrete walls as follows: Keep forms wet during the period forms are required to remain in place. Immediately after formed concrete has taken its initial set, start a gentle uniform flow of clean water over concrete to thoroughly wet all concrete surfaces and formwork and maintain this flow of water until forms are removed. Immediately after form removal, cure concrete surfaces with one of the curing methods specified.

D. Interior Coating System: All interior concrete surfaces for the influent junction box, influent pump station, influent splitter box and the headworks shall be coated using the following system or an approved equal:

COATING SYSTEM				
		M.D.F.T.		
1 ST Coat	Tnemec Series 120-5002 Vinester	15.0-18.0		
2 nd Coat	Tnemec Series 120-5003 Vinester F&S	As required to fill voids and		
		bugholes		
3 rd Coat	Tnemec Series 120-5001 Vinester	15.0-18.0		

E. Surface Preparation: Allow to cure for 28 days. Remove all form oil, dirt, grease, form release agents, curing compounds/membranes, sealers, hardeners and all other contaminants. Application of coatings to be in strict accordance with manufacturer's recommendation. The final system shall be verified void and pinhole free.

DIVISION 4 – MASONRY

SECTION 04810

UNIT MASONARY ASSEMBLIES

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SECTION 04810

UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Concrete Block Veneer.
- B. Concrete Block
- C. Hollow Brick.
- D. Mortar and Grout.
- E. Reinforcement and Anchorage.
- F. Flashings.
- G. Accessories.

1-02 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures; American Concrete Institute International: 2002.
- B. ACI 530.1/ASCE 6/TMS 602 Specification For Masonry Structures; American Concrete Institute International; 2002.
- C. ASTM A 82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1997a.
- D. ASTM A 153/A 153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2000.
- E. ASTM A 615/A 615M Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2001.
- F. ASTM C 91 Standard Specification for Masonry Cement; 1999.
- G. ASTM C 144 Standard Specification for Aggregate for Masonry Mortar; 1999.
- H. ASTM C 150 Standard Specification for Portland Cement; 2000.
- I. ASTM C 207 Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (Reapproved 1997).
- J. ASTM C 270 Standard Specification for Mortar for Unit Masonry; 2000.
- K. ASTM C 404 Standard Specification for Aggregates for Masonry Grout; 1997.
- L. ASTM C 476 Standard Specification for Grout for Masonry; 2001.
- M. ASTM C 652 Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale); 2000a.
- N. ASTM D 226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1997a.

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- C. Samples: Submit four samples of facing brick and block units to illustrate color, texture, and extremes of color range.

1-04 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1-05 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high, which includes mortar and accessories, structural backup, wall openings, flashings, and wall insulation.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1-06 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1-07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1-08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 - PRODUCTS

2-01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depth of 8.
 - 2. Special Shapes: Provide non-standard blocks configured for lintels, header, bond beams and sill.
 - 3. Load-Bearing Units: ASTM C90, normal weight.

- a. Both hollow and solid block as indicated.
- b. Exposed faces: Manufacturer's standard color and texture.
- c. Pattern: None
- B. Concrete Split-Face Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depth of 4.
 - 2. Special Shapes: Provide non-standard blocks configured for corners.
 - 3. Color and styles: Sahara by Dillion & Company or similar.

2-02 BRICK UNITS

- A. Hollow Facing and Building Brick: ASTM C 652, Grade SW; Type HBS; Class H40V.
 - 1. Color and texture: 150 Red Sunset; Denton Texas by Acme Brick or similar.
 - 2. Actual size: As indicated on drawings.

2-03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91, Type S.
 - 1. Colored mortar: Premixed cement as required to match Architect's color sample.
- B. Portland Cement: ASTM C 150, Type I; color as required to produce approved color sample.
 - 1. Hydrated Lime: ASTM C 207, Type S.
 - 2. Mortar Aggregate: ASTM C 144.
 - 3. Grout Aggregate: ASTM C 404.
- C. Water: Clean and potable.

2-04 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (300) deformed billet bars; galvanized.
- B. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- C. Multiple Wythe Joint Reinforcement: Truss type; adjustable; ASTM A82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than ½ inch of mortar coverage on each exposure.
- D. Strap Anchors: hot dip galvanized to ASTM A 153/A 153M, Class B-2.
- E. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.

- F. Wall Ties: hot dip galvanized to ASTM A 153/A 153M, Class B-2, anchoring systems for attachment of brick veneer to structural metal studs and other substrates:
 - 1. DW-10-X anchor with pronged legs top and bottom formed at right angles to accommodate varying thicknesses of drywall and/ or insulation. Plate shall be #12 ga. steel conforming to ASTM A525.
 - 2. Byna-tie with overlapping legs fabricated from cold-drawn steel wire 3/16" conforming to ASTM A82.
 - 3. Seismiclip to accommodate Byna-tie and 9 ga. continuous wire, with Seismiclip fabricated from rigid PVC conforming to ASTM D1784 and 9 ga. continuous wire with deformations, conforming to ASTM A82 (tensile strength) and ASTM A641 Class 3, 0.8 oz. zinc coating per sq. ft.
 - 4. Where concrete block units are the back-up substrate, use the DW-10HS anchors.
 - 5. Screws for securing anchors to metal studs or concrete masonry units shall be submitted to the Contracting Officer for his review prior to the beginning of any work.
- F. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B-2.
 - 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: triangular shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 2 inches with joint reinforcement consisting of two 9 gage side rods with welded 16 ga. sheet metal plates at 16" o.c., and a 12 ga. sheet metal pintle for insertion into slotted edge of welded plates.

2-05 FLASHINGS

- A. Plastic Flashings: Sheet polyvinyl chloride; 10 mil thick.
- B. Lap Sealant: Butyl type as specified in Section 07900.

2-06 ACCESSORIES

- A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 2 inch wide x by maximum lengths available.
- B. Building Wrap: Tyvek Commercial Wrap or approved equal.
- C. Nailing Strips: Preservative treated softwood, as specified in Section 06100 Rough Carpentry.
- D. Weep/Cavity Vents: Polyethylene tubing.
- E. Cavity Mortar Diverter: Semi-rigid polyethylene or polyester mesh blocks, sized to fill bottom of wall cavity and suspend mortar droppings above weep/cavity vents to allow cavity drainage.
- F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2-07 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
 - 1. Masonry below grade and in contact with earth: Type S.
 - 2. Exterior, loadbearing masonry: Type N.
 - 3. Exterior, non-loadbearing masonry: Type S.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards and manufacturer's recommended standards.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3-02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3-03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

D. Brick Units:

- 1. Bond: As indicated for different locations.
- 2. Coursing: Three units and three mortar joints to equal 8 inches.
- 3. Mortar Joints: Concave.

3-04 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.

- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3-05 WEEP/CAVITY VENTS

- A. Install weep/cavity vents in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, and at bottom of walls.
- B. Install cavity mortar diverter at base of cavity as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3-06 CAVITY WALL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3-07 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3-08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of

- openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- F. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- G. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- H. Concrete accent banding Secure the band as well as the wall panel above and below the band within 12 inches of the top and bottom of the band. Horizontal joint reinforcement is placed in the mortar joints above and below the band. Refer to NCMA technical note 5-2A.

3-09 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.
- F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- G. Concrete accent banding Secure the band as well as the wall panel above and below the band within 12 inches of the top and bottom of the band. Horizontal joint reinforcement is placed in the mortar joints above and below the band. Refer to NCMA technical note 5-2A.

3-10 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend plastic flashings to within 1/4 inch of exterior face of masonry.
- C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3-11 LINTELS

A. Install loose steel lintels over openings.

B. Maintain minimum 8 inch bearing on each side of opening.

3-12 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
- C. Size control joint in accordance with Section 07900 for sealant performance.

3-13 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3-14 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3-15 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3-16 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3-17 PROTECTION OF FINISHED WORK

A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.

DIVISION 5 - METALS

SECTION 05310

STEEL DECK

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SECTION 05310

STEEL DECK

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Roof deck.

1-02 REFERENCES

- A. AISI Specifications for the Design of Cold-Framed Steel Structural Members; current edition.
- B. ASTM A 36/A 36M Standard Specification for Carbon Structural Steel; 2000a.
- C. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- D. AWS D1.1 Structural Welding Code Steel; American Welding Society; 2002.
- E. AWS D1.3 Structural Welding Code Sheet Steel; American Welding Society; 1998.
- F. SDI (DM) Publication No. 30, Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Floor Deck Systems with Electrical Distribution; Steel Deck Institute; 2000.
- G. SSPC-Paint 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings; 1982 (Ed. 2000).
- H. UL (FRD) Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1-04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years of experience.
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1.
- C. Welded decking in place is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by Government if

- welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work at no expense to the Government.
- D. Underwriters Label: Provide metal deck units listed in Underwriters Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

1-05 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS

2-01 STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), with G90/Z275 galvanized coating.
 - a. Grade as required to meet performance criteria.
 - 2. Structural Properties:
 - a. Span Design: Minimum 3 spans.
 - 3. Minimum Metal Thickness, Excluding Finish: As shown on Drawings.
 - 4. Nominal Height: As shown on Drawings.
 - 5. Profile: Fluted; SDI WR.
 - 6. Side Joints: Lapped, mechanically fastened.
 - 7. End Joints: Lapped, welded or mechanically fastened.

2-02 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A 36/A 36M steel, shop primed, unless member is in contact with concrete or is to be fireproofed.
- B. Welding Materials: AWS D1.1.
- C. Fasteners: Galvanized hardened steel, self tapping.
- D. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.
- F. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2-03 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips and cover plates, 20 gage thick sheet steel; of profile and size required; finished same as deck.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3-02 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On concrete and masonry surfaces provide minimum 4 inch bearing.
- C. On steel supports provide minimum 3 inch bearing.
- D. Unless noted otherwise, fasten deck to steel support members at ends and intermediate supports at 6 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
 - 1. Welding: Use fusion welds through weld washers.
- E. Unless noted otherwise, at mechanically fastened male/female side laps fasten at 24 inches on center maximum.
- F. Unless noted otherwise, at welded male/female side laps weld at 18 inches on center maximum.
- G. Weld deck in accordance with AWS D1.3.
- H. Unless noted otherwise, at deck openings from 6 inches to 18 inches in size, provide 2 x 2 x 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- I. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- J. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- K. Place metal cant strips in position and fusion weld.
- L. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

DIVISION 5 - METALS

SECTION 05400

COLD FORMED METAL FRAMING

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SECTION 05400

COLD FORMED METAL FRAMING

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Exterior wall and interior wall framing.

1-02 REFERENCES

- A. AISI SG-971 Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 1996, with 2000 supplement.
- B. ASTM A 123/A 123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2000.
- C. ASTM A 611 Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled; 1997.
- D. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- E. ASTM A 1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; 2001.
- F. ASTM C 955 Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2000a.
- G. AWS D1.1 Structural Welding Code Steel; American Welding Society; 2002.
- H. SSPC-Paint 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1982 (Ed. 2000).

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Shop Drawings: Indicate component details, framed openings, and accessories or items required of related work.
 - 1. Describe method for securing studs to tracks and for bolted framing connections.
 - 2. Provide calculations for loadings and stresses of specially fabricated framing that have been stamped by a Professional Structural Engineer licensed in the State of Mississippi.
- C. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

1-04 QUALITY ASSURANCE

A. Calculate structural properties of framing members in accordance with requirements of

- AISI Specification for the Design of Cold-Formed Steel Structural Members.
- B. Manufacturer: Company specializing in manufacturing the types of products specified in this section, and with minimum five years of documented experience.
- C. Installer: Company specializing in performing the work of this section with minimum five years of documented experience.
- D. Design structural elements under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Mississippi.

1-05 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on the drawings.

PART 2 - PRODUCTS

2-01 FRAMING MATERIALS

- A. Studs and Track: ASTM C 955; studs formed to channel shape with punched web; Ushaped track in matching nominal width and compatible height.
 - 1. Gage and depth: As indicated on the drawings.
 - 2. Galvanized in accordance with ASTM A 653/A 653M G90/Z275 coating.
 - 3. Provide components fabricated from ASTM A 1008, Designation SS steel.
- B. Joists and Purlins: Fabricated from ASTM A 653/A 653M steel sheet, with G90/Z275 hot dipped galvanized coating.
 - 1. Base Metal: Structural Steel (SS), Grade 33/230.
 - 2. Gage and depth: As indicated on the drawings.

2-02 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I Inorganic, complying with VOC limitations of authorities having jurisdiction.

2-03 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: ASTM A 123/A 123M, hot dip galvanized to 1.3 oz/sq ft.
- B. Anchorage Devices: Power actuated.
- C. Welding: In conformance with AWS D1.1.

2-04 SHOP FABRICATED ASSEMBLIES

- A. Shop fabricate metal framing to the greatest extent possible.
- B. Fabricate assemblies of framed sections of sizes and profiles required; with framing

members fitted, reinforced, and braced to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3-02 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions.
- B. Align floor and ceiling tracks; locate to wall layout. Unless noted otherwise, secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
- C. Place studs at 24 inches on center; not more than 2 inches from abutting walls and at each side of openings, unless otherwise noted. Unless noted otherwise, connect studs to tracks using clip and tie method.
- D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
- F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- G. Install intermediate studs above and below openings to align with wall stud spacing.
- H. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing. Refer to Section 09260 Gypsum Board Assemblies for additional requirements.
- I. Attach cross studs to studs for attachment of fixtures anchored to walls.
- J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- K. Touch-up field welds and damaged galvanized surfaces with primer.

DIVISION 5 - METALS

SECTION 05401

LIGHT GAUGE PRE-ENGINEERED STEEL TRUSSES

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SECTION 05401

LIGHT GAUGE PRE-ENGINEERED STEEL TRUSSES

PART 1 - GENERAL

- 1-01 SUMMARY
- A. Metal roof trusses
- B. Anchorage, bracing, and bridging
- 1-02 REFERENCES
- A. Reference standards:
 - 1. ASTM:
 - a. ASTM A653 and A525
 - b. ASTM A780-93a "Repair of Damages and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - 2. American Welding Society (AWS):
 - a. AWS D1.1 "Structural Welding Code Steel."
 - b. AWS D1.3 "Structural Welding Code Sheet Steel."

1-03 PERFORMANCE REQUIREMENTS

- A. AISI "Specifications": Calculate structural characteristics of cold-formed metal framing according to AISI's "Cold Formed Steel Design Manual" March 1987 edition.
- B. Structural Performance: Design, engineer, fabricate and erect cold-formed metal framing to withstand design loads within limits and under conditions required:
 - 1. Design Loads: As indicated on the drawings.
 - 2. Design framing systems to withstand design loads without deflections greater than the following:
 - a. Roof Trusses: Vertical deflection of L/360 (L/600 for plaster ceiling).
 - 3. Design framing systems to provide movement of framing members without damage or over stressing, sheathing failure, undue strain of fasteners and anchors, or other detrimental effects when subject to a maximum temperature change (range) of 120 degrees. F. (67 deg. C)

1-04 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each type of cold-formed metal framing and accessory required.
- B. Submit shop drawings showing member, type, location, spacing, size and gauge of members, method of attachment to supporting members, permanent/supplemental bracing, strapping, bridging, and all necessary erection details.
 - 1. Truss Manufacturer to submit shop drawings showing:

- a. member, type, location spacing, size and gauge of members.
- b. location of required lateral web compression bracing
- c. all truss to truss connection details
- d. detailed roof truss layouts.
- e. submit structural calculations, sealed and signed by a qualified registered Professional Engineer in the state of Mississippi, verifying framing assembly's ability to meet or exceed local codes and design requirements.

1-05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Fabrication shall performed by experienced cold-formed metal framing truss fabricator with not less than three years experience designing and fabricating cold-formed metal trusses equal in material, design, and extent to the systems required for this project. Primary fabrication shall be conducted in permanent facility dedicated to the manufacturing of cold-formed metal trusses.
- B. Erectors Qualifications: Truss erection shall be performed by a qualified installer experienced in structural light gauge steel framing and recommended truss installation practices.

1-06 DELIVERY, STORAGE AND HANDLING

- A. Trusses to be delivered to job site individually labeled to match information in layout drawings. Exercise extreme care to avoid damage during unloading, storing and erection.
- B. Store trusses on blocking off of ground and in an upright position when possible to avoid damage from bending and over stressing. Protect metal from corrosion, deformation, damage, and deterioration when stored on job site. Keep trusses free of dirt and other foreign matter.

1-07 PROJECT CONDITIONS

A. During construction, distribute concentrated loads applied to trusses adequately so that carrying capacity of any one truss or other component is not exceeded.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Specifications:
 - 1. Fabricate truss components of commercial quality steel, ASTM A653 galvanized finish with a minimum yield point of 45 ksi.
 - 2. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet, ASTM A653 galvanized finish with a minimum yield of 33 ksi.
- B. Metal framing components: Provide sizes, shapes and gauges indicated:
 - 1. Design Uncoated-Steel Thickness: 20 Ga .0360 in

- 2. Design Uncoated-Steel Thickness: 18 Ga. .0470 in
- 3. Design Uncoated-Steel Thickness: 16 Ga. .0580 in
- 4. Design Uncoated-Steel Thickness: 14 Ga. .0750 in
- C. Finish: Provide components with protective zinc coating complying with ASTM A653, minimum G60 coating.
- D. Fastenings:
 - 1. Hilti self drilling screws, bolts, nuts and washers with corrosion-resistant plated finish or approved equal. Fasteners shall be of sufficient size to ensure the strength of the connection.
 - 2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8" thick.

2-02 FABRICATION

- A. Factory fabricate trusses and accessories plumb, square, true to line and with connections securely fastened.
 - 1. Fabricate truss assemblies in jig templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by screw fastening.
 - 4. Locate mechanical fasteners and install according to cold formed metal framing manufacturer's instructions with screws penetrating joined members by not less than 3 exposed screw threads.
 - 5. Splicing:
 - a. Splicing of webs is not permitted.
 - b. The following procedure must be followed when splicing of chord members is necessary:
 - 1. Splice chord members by using a 24-inch piece of chord material the same size and gauge of the chord material being spliced.
 - 2. Attach splice with a minimum of 4 screws each side of the splice but not less than what is required by design and calculations.
- B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift trusses to prevent damage or distortion.
 - C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to a line of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual web members no more than plus or minus 1 inch from plan location. Vertical webs located directly over bearing points shall be located plus or minus 1/8 inch from plan location.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Examine structure, substrates and installation conditions. Do not proceed with truss erection until unsatisfactory conditions have been corrected. Trusses should be installed so as to allow complete and adequate contact with truss connection member at all bearing locations as indicated.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3-02 INSTALLATION, GENERAL

A. General:

- 1. Erection of trusses, including proper handling, safety precautions, temporary bracing and other safeguards or procedures are the responsibility of the Contractor and Contractor's installer.
- 2. Exercise care and provide erection bracing required to prevent toppling or dominoeing of trusses during erection.
- B. Erect trusses with plane of truss webs vertical and parallel to each other accurately located at design spacing indicated.
- C. Provide proper lifting equipment suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members and joints during erection and to keep horizontal bending of trusses to a minimum.
- D. Provide framing anchors as indicated or accepted on the engineering design drawings or erection drawings. Anchor trusses securely at bearing points.
- E. Install truss framing and accessories plumb, square, true to line, and with connections safely fastened, according to manufacturer's recommendations.
- F. Provide temporary bracing and leave in place until all permanent bracing, framing, and sheathing is in place and securely fastened.
- G. Erection Tolerances: Install joist and truss framing to a maximum allowable tolerance variation from plumb, level and true to line of 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- H. Do not alter, cut or remove framing members or connections of trusses.
- I. Align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points as indicated.

3-03 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according ASTM A780 and the manufacturer's instructions.

DIVISION 5 - METALS

SECTION 05500

METAL FABRICATIONS

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SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Shop fabricated steel items not included in other sections.

1-02 REFERENCES

- A. ANSI A14.3 American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.
- B. ASTM A 36/A 36M Standard Specification for Carbon Structural Steel; 2000a.
- C. ASTM A 53/A 53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2000.
- D. ASTM A 123/A 123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2000.
- E. ASTM A 153/A 153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2000.
- F. ASTM A 283/A 283M Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2000.
- G. ASTM A 325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2000.
- H. ASTM A 325M Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 2000.
- I. ASTM A 500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1999.
- J. AWS D1.1 Structural Welding Code Steel; American Welding Society; 2002.
- K. SSPC-Paint 15 Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2000).
- L. SSPC-Paint 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1982 (Ed. 2000).
- M. SSPC-SP 2 Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2000).

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Welders' Certificates: Submit certification for welders employed on the project,

verifying AWS qualification within the previous 12 months.

PART 2 - PRODUCTS

- 2-01 MATERIALS STEEL
- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.
- C. Plates: ASTM A 283.
- D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M) galvanized to ASTM A 153/A 153M for galvanized components.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I Inorganic, complying with VOC limitations of authorities having jurisdiction.

2-02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2-03 FABRICATED ITEMS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish. See Drawings.
- B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, joists, and masonry; prime paint finish.
- D. Lintels: As detailed; prime paint finish.E. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.

2-04 FINISHES - STEEL

- A. Prepare surfaces to be primed in accordance with SSPC-SP2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Prime Painting: One coat.
- D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A 123/A 123M. Provide minimum 1.3 oz/sq ft galvanized coating.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M. Provide minimum 1.3 oz/sq ft galvanized coating.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3-02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
- C. Provide separation for dissimilar metals.

3-03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

DIVISION 5 - METALS

SECTION 05521

PIPE AND TUBE RAILINGS

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SECTION 05521

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1-01 SCOPE

- A. The work covered by this section includes furnishing all labor, equipment and materials required to furnish and install aluminum component handrail including all fittings, anchors, bases and accessories, and steel pipe and tube hand rails, balusters, and fittings as required by the contract documents.
- B. All guardrails shall be furnished with a toeboard, except where concrete curbs are shown.

1-02 SUBMITTALS

- A. Submit complete shop drawings and product.
- B. Submit samples which are representative of the material and finish to be provided.
- C. Submit structural calculations, including anchorages, if requested by the Project Contracting Officer.
- D. Provide certification by an engineer, registered in the state where project is to be build, that all safety requirements are met.
 - 1. Railings and assemblies, wall railings and their attachments shall resist these lateral forces at any given point without damage or permanent set.

1-03 STORAGE AND PROTECTION

A. Handrails shall be properly packaged to prevent scratching and denting during shipment, storage and erection. Maintain protective wrapping until project is completed.

PART 2 - PRODUCTS

2-01 DESIGN REQUIREMENTS

- A. Component aluminum handrail system shall be designed and constructed in strict compliance with the requirements of OSHA and the Standard Building Code.
- B. Guardrails shall be designed to withstand a uniform horizontal load of 50 pounds per foot with a simultaneous vertical load of 100 pounds per foot applied to the top rail.

2-02 GUARDRAILS, HANDRAILS AND RAILINGS

- A. Aluminum handrail and stair rails shall be designed to withstand a uniform horizontal load of 50 pounds per foot applied to the top rail.
- B. In addition, aluminum guardrails, handrails and stair rails shall be designed to withstand a concentrated load of 200 pounds applied in any direction, at any point on the railing system.
- C. Steel wall railings and their attachments shall be designed to resist a concentrated load of 200 pounds applied at any point and in any direction without damage or permanent

set. In addition handrails shall be designed and constructed for a load of 50 plf applied in any direction

2-03 MATERIAL AND CONSTRUCTION - ALUMINUM RAILINGS

- A. Handrail shall be the product of a company normally engaged in the manufacture of pipe railing. Railing shall be shop assembled in lengths not to exceed 24 feet for field erection.
- B. Post spacing shall be a maximum of 6'-0". Posts and rails shall be a minimum of 1 1/2" schedule 40 aluminum pipe, alloy 6063-T6 or 6105-T5, ASTM B-429 or B-221.
- C. Handrail shall be made of pipe and fittings mechanically fastened together with stainless steel hardware. Handrail systems which use fittings that are glued or pop-riveted will not be acceptable.
- D. Toeboard shall conform to OSHA standards. Toeboard shall be a minimum of 4" high and shall attach to the post using clamps which will allow for expansion and contraction between posts. Toeboard shall be set 1/4" above the walking surface.
- E. Wedge anchors shall be spaced 10d apart and 5d edge distance for no reduction in pullout strength. A safety factor of 4 shall be used on pullout values published by the manufacturer. Wedge anchors shall be type 303 stainless steel.
- F. Openings in the railing shall guarded by a self closing gate (OSHA 1910.23). Safety chains are not acceptable.
- G. All handrail and components shall be clear anodized per Aluminum Association M10C22A41 (215-R1). The pipe shall be plastic wrapped to protect the finish.
- H. All aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a coat of bituminous paint, mylar isolators or other approved material.

2-04 MATERIAL AND CONSTRUCTION - STEEL RAILINGS

A. Handrails shall be steel, of the cross sections, designs, and arrangements indicated. Shop-fabricate handrails into the largest practicable sub-assemblies which can be shipped to the job site, with all joints welded and ground smooth, ready for field installation without requiring field welding. Pipe shall be constructed of minimum Schedule 40, and pipe sizes shown are NOMINAL pipe sizes, NOT actual inside diameters or outside diameters

PART 3 - EXECUTION

3-01 INSTALLATION - ALUMINUM

- A. Field fabrication of the railing system is not permitted.
- B. Set handrails plumb within 1/8" of vertical and align horizontally to within 1/8" in 12 feet.

- C. Install wedge anchors to proper depth to develop full pullout and shear values. Check all fasteners and bolts in base connections and splices for tightness.
- D. Adequate provisions for expansion and contraction shall be incorporated into the rail. Expansion joints shall be placed at 60 foot intervals and at all concrete expansion joints.
- E. Toeboards shall be shipped loose and attached to the handrail in the field. Attachment to the posts will be made with clamps which will allow for expansion and contraction while maintaining a straight line.
- F. All defective, damaged or otherwise improperly installed handrail shall be removed and replaced with material which complies with this section at no additional cost to the owner.
- G. Following installation, aluminum handrail shall be cleaned with a mild soap and clean water. Acid solutions, steel wool or harsh abrasives shall not be used.

3-02 INSTALLATION - STEEL

- A. Installation: Install handrails with posts plumb, stair railings parallel to stair slopes, and other railings level, all rigidly secured to building structure except where removable or lift-out handrails are indicated. Connect shop-fabricated sub-assemblies with suitable mechanical connectors. Make provisions for free expansion and contraction of handrails.
 - 1. Floor mounted handrails: provide suitable sockets cast-in-place or core drilled in the concrete, and secure posts in sockets with non-shrinking grout as specified in Section 03300 Cast in Place Concrete, or bolt to steel as applicable.
 - 2. Face mounted handrails: secure these to building structure with fasteners suitable for the conditions involved and recommended by the approved shop drawings.

B. Treatment Steel Railing:

1. Touch up field welds by properly cleaning all of all slag and grinding smooth and applying two coats high zinc dust content paint to dry film thickness of a minimum thickness of 2 mils.

C. Repair or Replace Defective Work:

1. If stains or rust cannot be removed properly without damaging or deforming railings, they shall be replaced with new materials that meet specification requirements.

DIVISION 5 - METALS

SECTION 05530

GRATING AND FLOOR PLATES

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SECTION 05530

GRATING AND FLOOR PLATES

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Formed metal grating and flat surfaced floor plates.
- B. Formed openings.
- C. Perimeter closures.

1-01 RELATED SECTIONS

- A. Section 03300 CAST IN PLACE CONCRETE.
- B. Section 05120 STRUCTURAL STEEL.
- C. Section 05500 METAL FABRICATIONS.
- D. Section 05521 PIPE AND TUBE RAILINGS.
- E. Section 09900 PAINTING.

1-02 SHOP DRAWINGS

- A. Submit shop drawings for final approval.
- B. Clearly detail shapes, general construction, supports, span and deflection table, perimeter construction details, tolerance, and installation details.

1-03 SUBMITTALS

- A. Submit manufacturer's installation instructions.
- B. Submit samples of the following for final approval:
 - 1. One sample of each material using on project of adequate size to adequately judge construction and finish.

1-04 REFERENCES

A. ANSI/NAAMM A202.1 - Metal Bar Grating Manual.

- B. ANSI/ASTM A123 Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
- C. ASTM A36 Structural Steel.
- D. ASTM A525 General Requirements for Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process.
- E. ASTM A569 Steel, Carbon, Hot-rolled Sheet and Strip, Commercial Quality.
- F. ASTM B210 Aluminum-Alloy Drawn Seamless Tubes.
- G. ASTM B221 Aluminum and Aluminum-Alloy Extruded Bar, Rod, Wire, Shape and Tube.

1-05 SYSTEM DESCRIPTION

- A. Conform to applicable code for live and dead loads applicable to work of this Section.
- B. Load Design: ANSI/NAAMM A202.1.
- C. Live Load: 100 lbs/sq ft minimum.
- D. Deflection Under Live Load: 1/240 maximum.
- E. Size grating and plates to maximum deflection limits by single support design.

1-06 QUALITY ASSURANCE

A. Design grates and plates under direct supervision of a registered professional engineer experienced in design of building structures.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Sheet Steel: ASTM A569; A36; carbon steel with raised lug pattern.
- B. Formed Steel: ASTM A36, of shapes indicated or required.
- C. Aluminum: ASTM B221, extruded B210, drawn seamless tubular aluminum alloy, of shapes indicated or required.

2-02 FASTENERS

- A. Fasteners: Galvanized steel or stainless steel.
- B. Type manufacturers standard for the application involved.

2-03 FABRICATION

- A. Fabricate grates and plates to achieve design loads and the sizes indicated or required.
- B. Weld, Mechanically clinch or rivet joints of intersecting grating sections.
- C. Provide support framing for openings.
- D. Each individual grating section shall be banded all around with bars similar to the bearing bars, welded at all corners, and welded or otherwise securely attached to the ends of all bearing bars.

2-04 FINISHES

- A. Aluminum: Mill finish or as indicated on drawings.
- B. Galvanizing: ASTM A525, to G90.
- C. Non-slip Surfacing: Aluminum oxide.
- D. Grating Frames: Fabricate these of steel as detailed, and hot dip galvanize them after fabrication.
- E. Step Treads for Metal Stairs: These shall be factory fabricated assemblies, of the same materials and pattern as those of the gratings. All aluminum surfaces which will contact steel shall be factory treated to prevent electrolytic action.
 - 1. Secure step treads to steel stair stringers with stainless steel or galvanized steel bolts, nuts, and washers.

PART 3 - EXECUTION

3-01 INSPECTION

- A. Verify that opening sizes and dimensional variations are acceptable to suit grating and plating tolerances.
- B. Verify that supports and anchors are correctly positioned.
- C. Beginning of installation means acceptance of existing conditions.

3-02 INSTALLATION

A. Install grates and floor plates in accordance with manufacturer's instructions and approved shop drawing.

- B. Mechanically cut galvanized finished surfaces. Do not use flame cutting tools.
- C. Secure grating with mechanical fasteners to prevent movement.
- D. All aluminum surfaces which will contact steel shall be factory treated to prevent electrolytic action.

3-03 TOLERANCES

- A. Conform to ANSI/NAAMM A202.1
- B. Maximum Space Between Adjoining or Abutting Sections: 1/16 inch.
- C. Maximum Variation From Top Surface Plane of Adjoining or Abutting Sections: 1/16 inch.

DIVISION 6 - WOOD AND PLASTICS

SECTION 06100

ROUGH CARPENTRY

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ROUGH CARPENTRY

PART 1 - GENERAL

1-01 DESCRIPTION

A. The work required under this Section consists of lumber, protection and treatment of lumber, grounds, nailers, blocking, stripping, furring, rough hardware, and related items to complete the work as indicated on the Drawings and specified here.

1-02 DELIVERY AND STORAGE OF MATERIALS

A. On arrival at the job site, insure proper protection of all materials of this Section, including lumber and treated material, from damage and weather. Store materials in an area well drained, above grade, ventilated, and do not allow materials to be incorporated into the job which have been stored in contact with the ground.

1-03 INDUSTRY STANDARDS

- A. Sizes and thickness shall be interpreted in terms of the American Association of Lumber and Moulding Rules, except where the details show sizes and profiles at large scale or full size. In such cases, the larger details shall be followed. Grades shall be as defined by the rules of the recognized Association of Lumber Manufacturers producing the materials specified, but defects or blemishes prohibited by this Specification, even though permissible in grade, shall not appear in the materials used.
- B. Wood framing, bracing, cutting, nailing and spiking, unless shown otherwise, shall conform to the requirements of National Forest Products Association, "Manual for House Framing."

PART 2 - PRODUCTS

2-01 MISCELLANEOUS LUMBER

A. All plates, nailers, furring, blocking and grounds shall be of No. 2 Southern Yellow Pine, dressed to the sizes indicated and treated with preservative where specified.

2-02 FRAMING LUMBER

A. All framing lumber shall be of No. 2 SOUTHERN YELLOW PINE OR CONSTRUCTION GRADE DOUGLAS FIR, seasoned and kiln dried, S4S, in accordance with the latest Association Rules for grading and allowable moisture content.

2-03 PLYWOOD

A. Plywood shall be graded in accordance with U.S. Department of Commerce Produce Standard PS 1-66. Roof decking and storm sheathing shall be Structural 1, CD, "C" face plugged and sanded, waterproof glue. Thickness shall be as noted.

2-04 ROOF DECKING

A. Plywood for roof decking shall be STRUCTURAL I CD INT-APA (made only with exterior glue) "C" face plugged and sanded. Thickness shall be 5/8 inch.

2-05 EXTERIOR WOOD TRIM

A. Exterior wood trim where not shown otherwise shall be Clearfir Kiln dried premium grade.

2-06 INTERIOR WOOD TRIM

A. Interior wood trim where not shown otherwise shall be SOUTHERN YELLOW PINE "B AND BETTER".

2-07 WOOD SIDING

- A. Exterior wood siding to be 5/8" T1-11 PLYWOOD SIDING WITH GROVES 4: O. C. See Section 09900 Painting for Finish.
- B. Interior wood siding shall be 5/8" T1-11 plywood. See Section 09900 Painting for Finish.
- C. Ceiling shall be 3/8" fir plywood. Use screen moldings over joints. See Section 09900 Painting for Finish.

2-08 FURRING - BLOCKING - GROUNDS

A. Wood for furring, blocking, grounds and miscellaneous use shall be No. 2 SOUTHERN YELLOW PINE, KD, S4S in accordance with latest Association Rules for grading and moisture content.

2-09 WOOD PROTECTIVE TREATMENT

A. Lumber specified to be "treated" shall be pressure treated in strict accordance with the standards set forth by the American Wood Preserves Association. Retention shall be .40 for ground contact or .25 for above ground treated lumber. Under no circumstances shall creosote, oil, or any other method that will bleed be used.

2-10 ROUGH HARDWARE

A. Furnish of proper size and type all necessary nails, spikes, screws, bolts, washers, anchor and other rough hardware employed in connection with the work. All rough hardware for pressboxes to be galvanized or zinc plated.

2-11 METAL ACCESSORIES

A. Provide hurricane clips, joist hangers, framing anchors, etc., as noted, of proper size and design to suit conditions. Use ply-clips at mid-points of unsupported roof sheating edges.

2-12 FASTENING DEVICES

Anchors and fasteners for securing wood items, unless noted otherwise, shall be as follows:

a. Bolts:

- 1. Bolts, nuts, studs, and rivets shall conform to Federal Specifications FF-B-571a and FF-B-575, as applicable.
- 2. Expansion shields shall conform to Federal Specification FF-S-325. Shields shall be accurately recessed and, unless otherwise indicated, shall be not less than 2-1/2 inches into concrete or masonry. Devices of groups IV, V, VI, and VII shall not be used in sizes greater than 3/8 inch unless otherwise indicated.
- 3. Lag screws or lag bolts shall conform to Federal Specification FF-B-561b.
- 4. Toggle bolts shall conform to Federal Specification FF-B-588b.
- b. Screws: Wood screws shall conform to Federal Specification FF-S-111b.

c. Nails:

- 1. Nails and staples shall conform to Federal Specification FF-N-105a.
- 2. Tacks shall conform to Federal Specification FF-N-103c.

d. Ground Anchorage:

Wood plugs or nailing blocks are not acceptable for fastening grounds, furring, etc., to concrete or masonry. Hardened steel, nails, expansion screws, toggle bolts, metal plugs, or metal inserts, as most appropriate for each type of masonry or concrete construction shall be used.

e. Explosive-Driven Fastenings:

Explosive or power-driven fastenings may be used only when approved by the Contracting Officer.

PART 3 - EXECUTION

3-01 GENERAL REQUIREMENTS

- A. All line for partitions and openings shall be laid out to correct size and location for the use of other trades in construction of the work.
- B. Cooperate with mechanics of other trades who have work coming into contact or incorporated in the work under this section.
- C. Build shores and scaffolding, etc., substantially and of sufficient strength to safely carry imposed loads; thoroughly brace to hold rigidly in place. Allow shores to remain in place until construction work has set sufficiently for their removal.
- D. Provide wood grounds, furring and blocking of size and shape shown or required for securing wood trim, wall mounted accessories or other work or equipment in place. Set grounds true to line, level or plumb and well secured in place. Wood blocking or nailers on steel framing shall be bolted thereto at no more than 4'-0" centers.

3-02 WORKMANSHIP

A. All workmanship and materials shall be the best of their respective kinds. All materials used in finished work shall be clean, free from cracks, checks, knots and other imperfections that may interfere with the proper completion of the work. Any warped or otherwise imperfect work shall be replaced by parties responsible for same.

3-03 CONSTRUCTION METHODS

- A. Set all bolts, dowels, anchors, ties and fastenings of every description specifically shown or as required to properly install rough carpentry work.
- B. Install all wood plates, nailers, furring, blocking and grounds of the sizes indicated or required for the attachment of carpentry and other items and the work of other trades. Accurately set all rough carpentry items with close fitting joints, to required lines, planes and levels, properly and rigidly secured in place. Wood items to be secured to concrete and masonry with approved toggle bolts, lag screws, expansion bolts, screws or other approved devices; counter sunk where required, to prevent interference with adjacent work.

3-04 TREATED WOOD

A. Install treated wood where specified and in all locations where lumber is in contact with concrete or masonry which is to become a permanent part of the building, whether structural or not. Brush liberal coat of preservative on all surfaces of treated wood that are cut after treatment.

3-05 GENERAL REQUIREMENTS FOR FRAMING

- A. Unless otherwise indicated, framing shall conform to the following normal size requirements:
 - 1. Apply wood framing in exterior walls and interior partitions of wood studs, 2 inches in thickness x required wall and partition thickness.
 - 2. Space framing on 24 inch centers.
 - 3. Apply sole plates of 2 inch thick material x required wall and partition thickness.
 - 4. Apply other plates of 2 inch thick material (doubled) x required wall and partition thickness; stagger joints.
 - 5. Apply headers of either 2 inch thick material (doubled) or 4 inch thick material x depth of joints.
 - 6. Form corner posts and intersections of partitions with three members, 2 inches thick x wall or partition thickness; or of one solid member of equivalent size.
- B. Bridging: Brace walls between studs. Brace with members 2 inches by wall thickness.
- C. Nail or spike members in accordance with NFPA "Manual for House Framing".
- D. Joints, Rafters, and Beams:
 - 1. Set joists, rafters, and beams with crown edge up.
- E. Studs: Set studs on plates.
 - 1. Provide single top plates for non-bearing partitions, and double top plates for bearing partitions.
 - 2. Frame above openings less than 4 feet in width with two 2 x 8 inches members on edge. Provide wood separators between members to place faces in same plane as studs.
 - 3. Frame above openings over 4 feet in width with trusses headers. Support headers on jamb studs.

DIVISION 6 - WOOD AND PLASTICS

SECTION 06114

WOOD BLOCKING AND CURBING

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PART 1 – GENERAL

WOOD BLOCKING AND CURBING

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Roof nailers and curbs.
- B. Blocking in wall and roof openings.
- C. Preservative treatment of wood.
- D. Telephone and electrical panel boards.

1-02 REFERENCES

- A. AWPA C2 Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2000.
- B. AWPA C20 Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 1999.
- C. PS 1 Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

PART 2 - PRODUCTS

2-01 DIMENSION LUMBER

- A. Miscellaneous Blocking, Furring, and Nailers:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2-02 CONSTRUCTION PANELS

- A. Miscellaneous Panels:
 - 1. Concealed Plywood: PS 1, C-C Plugged, exterior grade.
 - 2. Exposed Plywood: PS 1, A-D, interior grade.
 - 3. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

2-03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Anchors: Toggle bolt type for anchorage to hollow masonry.

2-04 FACTORY WOOD TREATMENT

- A. Fire Retardant Treatment: AWPA Treatment C20, Exterior Type, Chemically treated and pressure impregnated.
- B. Pressure Treatment of Lumber Above Grade: AWPA Treatment C2 using waterborne preservative to 0.25 lb/cu ft retention.
 - 1. Kiln dry after treatment to maximum moisture content of 19 percent.
 - 2. Treat wood in contact with roofing, flashing, or waterproofing.
 - 3. Treat wood in contact with masonry or concrete.
 - 4. Treat wood less than 18 inches above grade.
- C. Pressure Treatment of Lumber in Contact with Soil: AWPA Treatment C2 using waterborne preservative designated in AWPA C2 as suitable for ground contact use to 0.4 lb/cu ft retention.

PART 3 - EXECUTION

3-01 INSTALLATION OF CONSTRUCTION PANELS

A. Install telephone and electrical panel back boards made of plywood or other acceptable structural panels at locations indicated. Size back boards to be minimum 96 inches beyond size of telephone and electrical panels.

3-02 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

3-03 SCHEDULES

- A. Roof Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.
- B. Telephone and Electrical Panel Boards: 1/4 inch thick, plywood or particleboard, fire retardant treated.

DIVISION 6 - WOOD AND PLASTICS

SECTION 06200

FINISH CARPENTRY

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FINISH CARPENTRY

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood window sill and stool.

1-02 REFERENCES

- A. ANSI A208.1 American National Standard for Particleboard; 1999.
- B. AWI P-200 Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.
- C. NEMA LD 3 High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 1995.
- D. PS 1 Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

1-03 SUBMITTALS

- A. See Section 00800 for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.

1-04 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.
- B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum three years of documented experience.

1-05 DELIVERY, STORAGE, AND PROTECTION

A. Protect work from moisture damage.

1-06 PROJECT CONDITIONS

- A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- B. Coordinate the work with plumbing rough-in and electrical rough-in.

PART 2 - PRODUCTS

2-01 LUMBER MATERIALS

A. Hardwood Lumber: oak species, plain sawn, maximum moisture content of 6 percent.

2-02 SHEET MATERIALS

- A. Softwood Plywood: PS 1 Grade A-B; Veneer core; pine face species.
- B. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.
- C. Pegboard: Pressed wood fiber with resin binder, standard grade; 1/8 in thick, with holes spaced at 1 in on center in both directions.

2-03 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: NEMA LD 3, HGS.
- B. Low Pressure Laminate: Melamine; white color, and surface texture as selected.
- C. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.

2-04 ADHESIVE

A. Adhesive: Type recommended by laminate manufacturer to suit application.

2-05 FASTENERS

A. Concealed Joint Fasteners: Threaded steel.

2-06 ACCESSORIES

- A. Lumber for Shimming, and Blocking: Softwood lumber.
- B. Primer: Alkyd primer sealer type.
- C. Wood Filler: Solvent base, tinted to match surface finish color.

2-07 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.
- C. Cap exposed plastic laminate finish edges with material of same finish and pattern.
 - D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

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- E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- F. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2-08 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. Prime paint surfaces in contact with cementitious materials.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3-02 INSTALLATION

- A. Set and secure materials and components in place, plumb and level.
- B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3-03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3-04 ERECTION TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

DIVISION 6 - WOOD AND PLASTICS

SECTION 06610

GLASS FIBER AND RESIN FABRICATIONS

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GLASS FIBER AND RESIN FABRICATIONS

PART 1 GENERAL

- 1-01 SECTION INCLUDES
- A. Glass fiber reinforced, resin brackets.
- 1-02 REFERENCES
- A. FM P7825 Approval Guide; Factory Mutual Research Corporation; current edition.
- B. ITS (DIR) Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- C. UL (BMD) Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- 1-03 SUBMITTALS
- A. See Section 01300 Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, adjacent construction, materials, thicknesses, fabrication details, required clearances, field jointing, tolerances, colors, finishes, methods of support, and anchorages.
- C. Samples: Submit two, 12x12 inch in size, illustrating color, texture, and finish.
- D. Maintenance Data: Include instructions for stain removal, surface and gloss restoration.
- 1-04 QUALITY ASSURANCE
- A. Shop Fabricator: Company specializing in architectural glass fiber and resin components with 5 years documented experience.
- 1-05 DELIVERY, STORAGE, AND PROTECTION
- A. Protect components from damage by retaining shipping protection in place until installation.
- 1-06 ENVIRONMENTAL REQUIREMENTS
- A. Do not install site fabricated components when site conditions may be detrimental to successful installation.
- B. Maintain temperature and humidity conditions favorable to proper curing of resin during and after installation.

PART 2 PRODUCTS

- 2-01 MATERIALS
- A. Fabric Reinforcement: Glass fiber woven fabric, 6.0 oz/sq yd.
- B. Roving: Continuous strand reinforcement for filament winding, single end, wound into tubeless packaging, for epoxy resin.
- C. Mat: Chopped fine glass fiber strand, sized into mat form, 9.5 oz/sq yd, for polyester

- resin gel coat backup.
- D. Resin: Polyester type, fire resistant, high workability characteristics, integral coloring additives.
- E. Polishing Cream: Compatible gel coat polishing cream to restore gloss surface finish.
- F. Core Framing: Softwood Lumber, clear and free of knots.
- 2-02 SHOP FABRICATION
- A. Mold Material: Wood with resin coating type.
- B. Mold Surface: Smooth.
- C. Fabricate components with the open mold spray-up method.
- D. Finish other surfaces not in contact with the mold to match the molded surfaces in appearance.
- E. Finish trim corners and edges.
- F. Coat exposed surfaces and surfaces in contact with moisture or earth with gel coat of colored resin.
- G. Cure components prior to shipment and remove material that may be toxic to plant or animal life.
- 2-02 FINISH
- A. Color: as selected.
- B. Exposed to view Surface Texture: smooth.

PART 3 - EXECUTION

- 3-01 EXAMINATION
- A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
- 3-02 INSTALLATION
- A. Install fabrications in accordance with shop drawings and fabricator's instructions.
- 3-03 TOLERANCES
- A. Maximum variation from true position: 1/4 inch.
 - B. Maximum offset from true alignment: 1/8 inch.
- 3-04 CLEANING
- A. Clean components of foreign material without damaging finished surface.
- B. Hand rub smooth surfaces with polishing cream.
- C. Clean fabrications in accordance with fabricator's instructions.

3-05 PROTECTION OF FINISHED WORK

A. Place protective structural covering over installed units.

DIVISION 6 - WOOD AND PLASTICS

SECTION 06620

CAST PLASTIC FABRICATION

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CAST PLASTIC FABRICATIONS

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Cast plastic washroom vanities and window sills.

1-02 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.

1-03 DESIGN REQUIREMENTS

A. Design vanities and sills with sufficient strength for handling and placement stresses.

1-04 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, integration of plumbing components, and anchorages.
- C. Samples: Submit two samples representative of vanity top, 6x6 inch in size, illustrating color, texture, and finish.
- D. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.
 - 1. Include instructions for stain removal, surface and gloss restoration.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed and registered with manufacturer.

1-05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1-06 PROJECT CONDITIONS

- A. Verify that field measurements are as indicated.
- B. Sequence Work to permit installation of adjacent affected construction, plumbing rough-in.

1-07 MAINTENANCE PRODUCTS

A. Provide two containers of 16 oz of polishing cream.

PART 2 PRODUCTS

2-01 MATERIALS

- A. Provide finished products having flame spread index of 35 and smoke developed index of 15, when tested in accordance with ASTM E 84 in thickness of 3/4 inch.
- B. Resin: Polyester type, with integral coloring, stain resistant to domestic chemicals and cleaners.
- C. Polishing Cream: Compatible polishing cream to achieve specified sheen to gel coat.
- D. Core Framing: Softwood lumber, clear and free of knots.
- E. Adhesive: type as recommended by manufacturer, cartridge dispensed.

2-02 FABRICATION

- A. Fabricate components by mold to achieve shape and configuration.
- B. Gel coat the finish exposed surfaces smooth and polish to a gloss sheen.
- C. Radius corners and edges.
- D. Cure components prior to shipment, except sheet materials requiring site handling.

2-03 FINISH

- A. Color: color as selected.
- B. Exposed to View Surface Visual Texture: Marbleized design.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify that joint preparation and affected dimensions are acceptable.

3-02 PREPARATION

- A. Provide anchoring devices for installation.
- B. Provide templates and rough-in measurements.

3-03 INSTALLATION

- A. Install components in accordance with shop drawings and manufacturer's instructions.
- B. Align work plumb and level.
- C. Rigidly anchor to substrate to prevent misalignment.

3-04 TOLERANCES

A. Maximum Variation From True Dimension: 1/8 inch.

- B. Maximum Offset From True Position: 1/8 inch.
- 3-05 CLEANING
- A. Clean and polish fabrication surfaces in accordance with manufacturer's instructions.
- 3-06 PROTECTION OF FINISHED WORK
- A. Do not permit construction near unprotected surfaces.

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07212

BOARD AND BATT INSULATION

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BOARD AND BATT INSULATION

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Board insulation and integral vapor retarder at cavity wall construction.
- B. Batt insulation and vapor retarder in exterior wall and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1-02 REFERENCES

- A. ASTM C 578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2000.
- B. ASTM C 612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2000a.
- C. ASTM C 665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1998.

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1-04 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 - PRODUCTS

2-01 BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type X; Extruded polystyrene board with cut cell surfaces; with the following characteristics:
 - 1. Board Size: 48 x 96 inch.
 - 2. Board Thickness: 1 inches.
 - 3. Board Edges: Square.
 - 4. Compressive Resistance: 25 psi.
 - 5. Board Density: 1.3 lb/cu ft.
 - 6. Water Absorption, maximum: 0.3 percent, volume.
- B. Glass Fiber Board Insulation: Rigid glass fiber, ASTM C 612; top surface coated with

28 lb/square asphalt and Kraft paper, insulation with the following characteristics:

2-02 BATT INSULATION MATERIALS

- A. Batt Insulation: ASTM C 665; preformed glass or mineral fiber batt; friction fit, conforming to the following:
 - 1. Thermal Resistance: R of 19 for walls and R of 30 for roofs.
 - 2. Facing: Faced on one side with asphalt treated Kraft paper.

2-03 ACCESSORIES

- A. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be mechanically fastened to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- B. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3-02 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure impale fasteners to substrate at a frequency as follows:
 - 1. 6 per insulation board.
- B. Apply adhesive to back of boards:
 - 1. Three continuous beads per board length.
 - 2. Full bed 1/8 inch thick.
- C. Install boards to fit snugly between wall ties.
 - 1. Place membrane surface against adhesive.
 - 2. Place membrane surface facing out, and tape seal board joints.
- D. Install boards horizontally on walls.
 - 1. Place boards to maximize adhesive contact.
 - 2. Install in running bond pattern.
 - 3. Butt edges and ends tightly to adjacent boards and to protrusions.
 - 4. Place impale fastener locking discs.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- F. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames. Tape seal in place to ensure continuity of vapor retarder and air seal.

3-03 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane between framing members.
- F. Tape insulation batts in place.
- G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- H. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.
- I. Tape seal tears or cuts in vapor retarder.
- J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3-04 PROTECTION OF FINISHED WORK

A. Do not permit installed insulation to be damaged prior to its concealment.

3-05 SCHEDULES

- A. Perimeter Insulation: Extruded polystyrene, bead adhesive application, 1/2 inch thick protection board.
- B. Cavity Wall Insulation: Semi-rigid glass fiber board, full bed vapor retarder adhesive, secured with impaling fasteners.
- C. Metal Framed Wall Insulation: R-19 fiberglass batts with integral vapor barrier, taped to metal studs.
- D. Metal Framed Roof Insulation: R-30 fiber glass batts with integral vapor barrier, mechanically fastened to structure.

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07610

SHEET METAL ROOFING

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SHEET METAL ROOFING

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Mechanically seamed panel metal roofing system.
- B. Soffit Panels

1-02 REFERENCES

- A. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- B. ASTM A 792/A 792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 1999.
- C. ASTM E 1592 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 1998.
- D. FM 4471 Class 1 Panel Roof (Uplift Evaluation); Factory Mutual Research Corporation; 1998.
- E. UL 580 Standard for Tests for Uplift Resistance of Roof Assemblies; 1994.

1-03 DESIGN REQUIREMENTS

- A. Wind Uplift: Roofing panel system, including panels, clips, and fasteners to meet requirements of UL Class 90 for indicated exposure.
- B. Static Air Infiltration: Completed roof system shall have a maximum of 0.06 CFM/sq.ft. with 6.24 PSF air pressure differential as per ASTM E 283.
- C. Water Infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 6.24 PSF and not more than 12.00 PSF as per ASTM E 331.
- D. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
- E. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
- F. Products: Provide continuity of thermal barrier at building enclosure elements.

1-04 SYSTEM DESCRIPTION

- A. Factory formed, prefinished standing seam metal roofing system with concealed fasteners over solid substrate. Perimeter trim to match.
- B. Factory formed, vent units to match roof system.

C. Panels manufactured in continuous lengths up to 40ft.

1-05 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog data, detail sheets, and specifications.
- C. Shop Drawings: Prepared specifically for this project; showing layout of panels, details of edge conditions, joints, corners, panel profiles, clips, trim, flashing and special details.
- D. Selection Samples: Two sets of color chips representing manufacturer's full range of standard colors and finishes.
- E. Verification Samples: Two samples, minimum size 6 inches square, of each selected color and finish, representing actual color and finish of products to be installed.

1-06 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 10 years of documented experience.
- B. Installer: Company certified and approved by manufacturer.

1-07 DELIVERY, STORAGE AND HANDLING

- A. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture run-off.
- B. Prevent contact with material that may cause corrosion, discoloration or staining.
- C. Trim with strippable film shall not be exposed to direct sunlight or extreme heat.

1-08 WARRANTY

- A. See Section 00800 Special Contract Requirements, for additional warranty requirements.
- B. Provide a 20 year non-prorated warranty for the paint finish covering cracking, checking, blistering, peeling, flaking, chipping, chalking and resistance to color fade.
- C. Provide single source 10 year weathertightness warranty.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Aluminum Sheet: Alloy 3105-H24; 0.032 inch thickness.
- B. Galvanized Steel Sheet: ASTM A 653/A 653M, G90/Z275 coated.
- C. Galvalume(R): ASTM A 792/A 792M; Bethlehem Steel Corporation cold-rolled steel sheet to which corrosion-resistant aluminum-zinc alloy coating is factory-applied.

2-02 MANUFACTURED UNITS

- A. Mechanically Seamed Panels:
 - 1. Profile: S2500, 2 inch standing seam, heavy duty interlock clips; UL 580; Class 90 tested; ASTM E 1592 tested; tested for water and air infiltration, and FM I-90 rated.
 - a. Appearance Options: Striated pattern.
- B. Flush-Wall Interlock Soffit Panels:
 - 1. Profile: 1/2" on center "V" grooved panels in .032 aluminum with Kynar finish.

2-03 ACCESSORIES

- A. Sealant: Manufacturer's standard type suitable for use with installation of system; non staining; color to match panels.
- B. Vents: Kynar coated galvanized steel sheet frames and louvers with insect screens. Color to match roof panels.
- C. Roof Underlayment: ASTM D 226, Type II No. 30 asphalt saturated organic roofing felt lapped, staggered and applied horizontally from eave to ridge.
- D. Bituminous Coating: Cold-applied asphaltic mastic, free of asbestos fibers, sulfur, and other harmful impurities.
- E. Touch-Up Paint: Approved by panel manufacturer.

2-04 FINISHES

- A. 70 Percent Kynar 500(R) Coating (PermaColor 2000): Top Side.
 - 1. Color: To be selected from manufacturer's standard non-metalic colors.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Examine surfaces to receive sheet metal roofing. Notify the Architect in writing of any defective conditions encountered.
- B. Correct defective conditions before beginning work. Starting of work shall constitute acceptance of such conditions.

3-02 INSTALLATION

- A. Except as otherwise shown or specified, comply with recommendations and instructions of manufacturer of sheet metal roofing being fabricated and installed.
- B. Conform to standards set forth in the SMACNA architectural sheet metal manuals.

- C. Install panels plumb, level and straight with seams and ribs parallel, conforming to the design as indicated.
- D. Install panels so that they are weathertight without waves, warps, buckles or distortions and allow for expansion and contraction. Exercise care in handling panels and trim to prevent surface damage.
- E. Caulk all flashing and panel joints that require caulking to prevent water penetration.
- F. Ribbed pans will be vertically broken under ridges and hooked at the eaves to insure weathertightness.
- G. Remove masking on trim flashings immediately after installing.
- H. Hem all raw edges on flashing.

3-03 CLEANING

- A. Leave panels clean and free from fringes, marks, grease and stains.
- B. Thoroughly clean and touch-up any areas scarred during installation with a touch-up paint approved by panel manufacturer. Only minor scratches and fastener heads shall be touched-up; any other damaged material shall be replaced.

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07631

GUTTERS AND DOWNSPOUTS

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2-04	FABRICATION
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3-01	EXAMINATION
3-02	PREPARATION
3_03	INSTALLATION

GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Pre-finished aluminum gutters and downspouts.
- B. Precast concrete splash pads.

1-02 REFERENCES

- A. ASTM B 32 Standard Specification for Solder Metal; 2000.
- B. ASTM B 209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2000.
- C. ASTM B 209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2000.
- D. SMACNA (ASMM) Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

1-03 DESIGN REQUIREMENTS

- A. Conform to SMACNA Architectural Sheet Metal Manual for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.
- B. Conform to applicable code for size and method of rain water discharge.
- C. Maintain one copy of each document on site.

1-04 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- C. Samples: Submit two samples, 6 inch long illustrating component design, finish, color, and configuration.

1-05 DELIVERY, STORAGE, AND PROTECTION

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
 - B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Pre-Finished Aluminum Sheet: ASTM B 209 (ASTM B 209M); 0.032 inch thick.
 - 1. Finish: Plain, shop pre-coated with modified silicone coating.
 - 2. Color: As scheduled.
- B. Protective Backing Paint: Zinc molybdate alkyd.
- C. Solder: ASTM B 32; Sn50 (50/50) type.

2-02 COMPONENTS

- A. Gutters: Profile as indicated.
- B. Downspouts: CDA Rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Anchoring Devices: In accordance with CDA requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.
- D. Fasteners: Galvanized steel, with soft neoprene washers.

2-03 ACCESSORIES

A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2-04 FABRICATION

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
 - E. Fabricate gutter and downspout accessories; seal watertight.

2-05 FACTORY FINISHING

A. Class II Color Anodized Finish: AAMA 606.1 AA-M12C22A41; integrally colored anodic coating not less than 0.4 mils thick.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

3-02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3-03 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- C. Slope gutters 1/4 inch per foot.
- D. Set splash pans under downspouts.

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07900

JOINT SEALERS

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2-01	SEALANTS
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3-01	EXAMINATION
3-02	PREPARATION
3-03	INSTALLATION
3-04	CLEANING
3-05	PROTECTION OF FINISHED WORK

JOINT SEALERS

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Sealants and joint backing.
- 1-02 QUALITY ASSURANCE
- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum two years experience.
- 1-03 ENVIRONMENTAL REQUIREMENTS
- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 PRODUCTS

- 2-01 SEALANTS
- A. General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; multi- component.
 - 1. Color: To match adjacent surfaces.
 - 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
- B. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
 - 1. Applications: Use for:
 - a. Concealed sealant bead in sheet metal work.
 - b. Under thresholds.
- C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
 - 1. Color: Standard colors matching finished surfaces.
 - 2. Applications: Use for:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- D. Bathtub/Tile Sealant: White silicone; ASTM C 920, Uses I, M and A; single component, mildew resistant.
 - 1. Applications: Use for:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
- E. Bathtub/Tile Sealant: Clear silicone; ASTM C 920, Uses M and A; single component, mildew resistant.
 - 1. Applications: Use for:
 - a. Joints between countertops and wall surfaces.

- F. Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, I, M and A; single component.
 - 1. Color: Color as selected.
 - 2. Applications: Use for:
 - a. Joints in sidewalks and vehicular paving.
- G. Silicone Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.
 - 1. Color: Standard colors matching finished surfaces.
 - 2. Movement Capability: Plus and minus 25 percent.
 - 3. Service Temperature Range: -65 to 180 degrees F.
 - 4. Shore A Hardness Range: 15 to 35.
 - 5. Applications: Use for:
 - a. Joints in aluminum storefront framing system.
 - b. Joints in skylight framing system.

2-02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
 - B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3-02 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3-03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C 1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.
- 3-04 CLEANING
- A. Clean adjacent soiled surfaces.
- 3-05 PROTECTION OF FINISHED WORK
- A. Protect sealants until cured.

SECTION 08110

STEEL DOORS AND FRAMES

PART 1	- GENERAL
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1-04	QUALITY ASSURANCE
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2-05	ACCESSORIES MATERIALS
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3-03	INSTALLATION
3-04	ERECTION TOLERANCES
3-05	ADJUSTING

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Non-fire-rated steel doors and frames.
- B. Steel frames for wood doors.
- C. Thermally insulated steel doors.
- D. Steel glazing frames.
- E. Accessories, including glazing.

1-02 REFERENCES

- A. ANSI/ICC A117.1 American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.
- B. ANSI A250.8 SDI-100 Recommended Specifications for Standard Steel Doors and Frames: 1998.
- C. ANSI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998.
- D. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- E. DHI A115 Series Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI A115 Series).
- F. NAAMM HMMA 840 Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1999.

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1-04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Maintain at the project site a copy of all reference standards dealing with installation.

1-05 DELIVERY, STORAGE, AND PROTECTION

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 - PRODUCTS

2-01 DOORS AND FRAMES

- A. Requirements for All Doors and Frames:
 - 1. Accessibility: Comply with ANSI/ICC A117.1.
 - 2. Door Top Closures: Flush with top of faces and edges.
 - 3. Door Edge Profile: Beveled on both edges.
 - 4. Door Texture: Smooth faces.
 - 5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
 - 6. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 - 7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
 - 8. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2-02 STEEL DOORS

A. Exterior Doors:

- 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
- 2. Core: Polystyrene foam.
- 3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
- 4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
- 5. Texture: Smooth faces.
- 6. Weatherstripping: Separate, see Section 08710.

B. Interior Doors, Non-Fire-Rated:

- 1. Grade: ANSI A250.8 Level 1, physical performance Level C, Model 2, seamless.
- 2. Core: Cardboard honeycomb.
- 3. Thickness: 1-3/4 inches.

4. Texture: Smooth faces.

2-03 STEEL FRAMES

A. General:

- 1. Comply with the requirements of grade specified for corresponding door, except:
 - a. ANSI A250.8 Level 1 Doors: 16 gage frames.
 - b. ANSI A250.8 Level 3 Doors: 14 gage frames.
 - c. ANSI A250.8 Level 4 Doors: 12 gage frames.
 - d. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage
- 2. Finish: Same as for door.
- 3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- 4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- 5. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- B. Exterior Door Frames: Face welded, seamless with joints filled.
 - 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
 - 2. Weatherstripping: Separate, see Section 08710.
- C. Interior Door Frames, Non-Fire-Rated: Fully welded type.
- D. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

2-04 ACCESSORY MATERIALS

- A. Glazing: As specified in Section 08800, factory installed.
- B. Removable Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2-05 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient

coating.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3-02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3-03 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Coordinate installation of hardware.
- E. Coordinate installation of glazing.

3-04 ERECTION TOLERANCES

- A. Clearances Between Door and Frame: As specified in ANSI A250.8.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3-05 ADJUSTING

A. Adjust for smooth and balanced door movement.

SECTION 08211

FLUSH WOOD DOORS

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2-02	DOORS AND PANEL CORES
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3-03	INSTALLATION TOLERANCES
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SECTION 08211

FLUSH WOOD DOORS

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Flush wood doors; flush configuration; non-rated.

1-02 REFERENCES

A. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, special blocking for hardware, identify cutouts for glazing.
- C. Samples: Submit two samples of door construction, 6x6 inch in size cut from top corner of door.
- D. Manufacturer's Installation Instructions: Indicate special installation instructions.

1-04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1-05 DELIVERY, STORAGE, AND PROTECTION

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1-06 PROJECT CONDITIONS

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1-07 WARRANTY

- A. See Section 00800, for additional warranty requirements.
- B. Provide warranty for the following term:
 - 1. Interior Doors: Two (2) years.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 - PRODUCTS

2-01 DOORS

- A. All Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: AWI Architectural Woodwork Quality Standards Illustrated, Section 1300, Custom Grade.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at all locations.
 - 2. Wood veneer facing for field opaque finish.

2-02 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type PC, particleboard core, plies and faces as indicated above.

2-03 DOOR FACINGS

A. Veneer Facing for Opaque Finish: Medium density overlaid plywood.

2-04 ACCESSORIES

A. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

2-05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Provide solid blocks at lock edge for hardware reinforcement.
 - 1. Provide solid blocking for other throughbolted hardware.
- C. Fit door edge trim to edge of stiles after applying veneer facing.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings.
- F. Provide edge clearances in accordance with AWI Quality Standards Illustrated Section 1700.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3-02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Trim non-rated door width by cutting equally on both jamb edges.
- C. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
- D. Use machine tools to cut or drill for hardware.
- E. Coordinate installation of doors with installation of frames and hardware.
- F. Coordinate installation of glazing.

3-03 INSTALLATION TOLERANCES

- A. Conform to specified quality standard for maximum diagonal distortion.
- B. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inches surface area.
- C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inches surface area.

3-04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

SECTION 08360

OVERHEAD DOORS

PART 1	– GENERAL
1-01	SECTION INCLUDES
1-02	REFERENCES
1-03	SUBMITTALS
1-04	QUALITY ASSURANCE
1-05	WARRANTY
PART 2	- PRODUCTS
2-01	STEEL DOOR COMPONENTS
2-02	DOORS COMPONENTS
2-03	MATERIALS
PART 3	- EXECUTION
3-01	EXAMINATION
3-02	PREPARATION
3-03	INSTALLATION
3-04	ERECTION TOLERANCES
3-05	ADJUSTING
3-06	CLEANING AND PROTECTION

SECTION 08360

OVERHEAD DOORS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Overhead sectional doors, manually operated.
- B. Operating hardware and supports.

1-02 REFERENCES

- A. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- B. ASTM E 330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1997.
- C. DASMA 102 American National Standard Specifications for Sectional Overhead Type Doors; Door & Access Systems Manufacturers' Association, International; 1996.

1-03 SUBMITTALS

- A. See Section 00800 Special Contract Requirements, for submittal procedures.
- B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- C. Product Data: Show component construction, anchorage method, and hardware.
- D. Samples: Submit two panel finish samples, 6x6 inch in size, illustrating color and finish.
- E. Operation Data: Include normal operation, troubleshooting, and adjusting.
- F. Warranty: Submit manufacturer warranty materials upon completion of the Project.

1-04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1-05 WARRANTY

- A. See Section 00800 for warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2-01 STEEL DOOR COMPONENTS

A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.

- 1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E 330, using 10 second duration of maximum load.
- 2. Door Nominal Thickness: 2 inches thick.
- 3. Exterior Finish: Pre-finished with baked enamel of color as selected.
- 4. Operation: Pull rope.
- B. Door Panels: Flush steel construction; outer steel sheet of 0.058 inch thick, flat profile; inner steel sheet of 0.058 inch thick, flat profile; core reinforcement of 0.058 thick sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; insulated.

2-02 DOOR COMPONENTS

- A. Track: Galvanized steel angles, 0.094 inch thick; 2-5/16 x 4 inch size, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.
- B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
- C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
 - 1. For Manual Operation: Requiring maximum exertion of 25 lbs force to open.
- D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.
- E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
- F. Head Weatherstripping: EPDM rubber seal, one piece full length.
- G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.
- H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.
- I. Lock Cylinders: Master keyed to building keying system.

2-03 MATERIALS

- A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, with G60/Z180 coating, plain surface.
- B. Insulation: Rigid polyurethane,.
 - 1. Same thickness as core framing members.
- C. Metal Primer Paint: Zinc molybdate type.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

3-02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3-03 INSTALLATION

- A. Install door unit assembly in accordance with manufacturer's instructions.
- B. Anchor assembly to wall construction and building framing without distortion or stress.
- C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- D. Fit and align door assembly including hardware.
- E. Install closures.

3-04 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch.
- B. Maximum Variation from Level: 1/16 inch.
- C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
- D. Maintain dimensional tolerances and alignment with adjacent work.

3-05 ADJUSTING

- A. Adjust door assembly for smooth operation and full contact with weatherstripping.
 - B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3-06 CLEANING AND PROTECTION

- A. Clean doors, and frames.
- B. Remove temporary labels and visible markings.
- C. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

SECTION 08410

METAL FRAMED STOREDFRONTS

PART 1	– GENERAL
1-01	SECTION INCLUDES
1-02	REFERENCES
1-03	PERFORMANCE REQUIREMENTS
1-04	SUBMITTALS
1-05	QUALITY ASSURANCE
1-06	PRE-INSTALLATION MEETING
1-07	ENVIRONMENTAL REQUIREMENTS
PART 2	2 – PRODUCTS
2-01	COMPONENTS
2-02	METARIALS
2-03	FINISHES
2-04	HARDWARES
2-05	FABRICATION
PART 3	3 – EXECUTION
3-01	EXAMINATION
3-02	INSTALLATION
3-03	ERECTION TOLERANCES
3-04	FIELD QUALITY CONTROL
3-05	ADJUSTING
3-06	CLEANING AND PROTECTION

SECTION 08410

METAL-FRAMED STOREFRONTS

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Aluminum-framed storefront.
- B. Aluminum doors and frames and door hardware.
- C. Perimeter sealant.
- 1-02 REFERENCES
- A. AA DAF-45 Designation System for Aluminum Finishes; The Aluminum Association, Inc.; 1997, Eighth Edition.
- B. AAMA 501.2 Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 1994 (part of AAMA 501).
- C. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association: 1998.
- D. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 1998.
- E. ASCE 7 Minimum Design Loads for Buildings and Other Structures; American Society of Civil Contracting Officers; 1998 (Pub. 2000).
- F. ASTM B 221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.
- G. ASTM B 221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2000.
- H. ASTM E 283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991 (Reapproved 1999).
- I. ASTM E 330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1997.
- J. ASTM E 331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000.
- 1-03 PERFORMANCE REQUIREMENTS
- A. Design and size components to withstand the following load requirements without

damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.

- 1. Design Wind Loads: Comply with requirements of ASCE 7.
- 2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
- D. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.
- E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- F. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.
- G. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

1-04 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.
- E. Samples: Submit two samples 12x12 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
- F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- G. Report of field testing for water leakage.
 - H. Warranty: Submit manufacturer warranty and ensure forms have been completed in

Owner's name and registered with manufacturer.

1-05 QUALITY ASSURANCE

- A. Design structural support framing components under direct supervision of a Registered Professional Structural Engineer experienced in design of this Work.
- B. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1-06 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1-07 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

PART 2 - PRODUCTS

2-01 COMPONENTS

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I color anodized.
 - 2. Color: As selected from manufacturer's standards.
- B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Glazing stops: Flush.
- C. Doors: Glazed aluminum.
 - 1. Thickness: 1-3/4 inches.
 - 2. Top Rail: 6 inches wide.
 - 3. Vertical Stiles: 4-1/2 inches wide.
 - 4. Bottom Rail: 6 inches wide.
 - 5. Glazing Stops: Square.
 - 6. Finish: Same as storefront.

2-02 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M).
- B. Fasteners: Stainless steel.

- C. Perimeter Sealant: Type specified in Section 07900.
- D. Glass: As specified in Section 08800.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2-03 FINISHES

- A. Comply with AA DAF-45 for aluminum finishes required.
- B. Class I Color Anodized Finish: AAMA 611 AA-C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick.
- C. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; color as scheduled.

2-04 HARDWARE

- A. Door Hardware: Storefront manufacturer's standard type to suit application.
 - 1. Finish on Hand-Contacted Items: Polished stainless steel.
 - 2. Include for each door weatherstripping, sill sweep strip, threshold, pivots, push handle, pull handle, and closer.

2-05 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- E. Arrange fasteners and attachments to conceal from view.
- F. Reinforce components internally for door hardware.
- G. Reinforce framing members for imposed loads.
- H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
 - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3-02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install hardware using templates provided.
- J. Install glass in accordance with Section 08800, using glazing method required to achieve performance criteria.
- K. Install perimeter sealant in accordance with Section 07900.

3-03 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3-04 FIELD QUALITY CONTROL

- A. See Section 00800, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.
 - B. Test installed storefront for water leakage in accordance with AAMA 501.2.

3-05 ADJUSTING

A. Adjust operating hardware for smooth operation.

3-06 CLEANING AND PROTECTION

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.
- D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- E. Protect finished work from damage.

SECTION 08520

ALUMINUM WINDOWS

PART 1	– GENERAL
1-01	SECTION INCLUDES
1-02	REFERENCES
1-03	PERFORMANCE REQUIREMENTS
1-04	SUBMITTALS
1-05	QUALITY ASSURANCE
1-06	ENVIRONMENTAL REQUIREMENTS
1-07	WARRANTY
PART 2	2 – PRODUCTS
2-01	WINDOWS
2-02	COMPONENTS
2-03	METARIALS
2-04	FABRICATION
2-05	FINISHES
PART 3	3 – EXECUTION
3-01	EXAMINATION
3-02	INSTALLATION
3-03	ERECTION TOLERANCES
3-04	FIELD QUALITY CONTROL
3-05	ADJUSTING AND CLEANING

SECTION 08520

ALUMINUM WINDOWS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash.
- B. Factory glazing.

1-02 REFERENCES

- A. AAMA/NWWDA 101/I.S.2 Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 1997 with revisions contained in "reprinting" of 12/99.
- B. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.
- C. ASCE 7 Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 1998 (Pub. 2000).
- D. ASTM A 123/A 123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2000.
- E. ASTM B 209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2000.
- F. ASTM B 209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2000.
- G. ASTM B 221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.
- H. ASTM B 221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2000.
- I. ASTM E 283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991 (Reapproved 1999).
- J. ASTM E 330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1997.
- K. ASTM E 331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000.
- L. ASTM E 1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2000.
- M. SSPC-Paint 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1982 (Ed. 2000).

N. SSPC-Paint 25.1 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel; Society for Protective Coatings; 1997 (Ed. 2000).

1-03 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: As specified in PART 2, with the following additional requirements:
- B. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
 - 1. Design Wind Loads: Comply with requirements of ASCE 7.
 - 2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- C. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- D. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
- E. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.
- F. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly.
- G. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.

1-04 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations,, and installation requirements.
- C. Certificates: Certify that windows meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1-05 QUALITY ASSURANCE

A. Manufacturer and Installer: Company specializing in fabrication of commercial aluminum windows of types required, with not fewer than three years of experience.

1-06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1-07 WARRANTY

A. See Section 00800, for additional warranty requirements.

PART 2 - PRODUCTS

2-01 WINDOWS

- A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.
- B. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Double; gray tinted; transparent.
 - 3. Exterior Finish: Class I color anodized.
 - 4. Interior Finish: Class I color anodized.

2-02 COMPONENTS

- A. Frames: 2-1/4" frame depth; extruded aluminum with integral structural polyurethane thermal break in the frame members; equal leg frame; finish factory-applied; frames factory-assembled.
- B. Sills: extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening jamb angles to terminate sill end.
- C. Glass and Glazing Materials: As specified in Section 08800.
- D. Sealant and Backing Materials: As specified in Section 07900.

2-03 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B 209 (ASTM B 209M), 5005 alloy, H12 or H14 temper.
- C. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A 123/A 123M to 2.0 oz/sq ft.

2-04 FABRICATION

- A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices.
- D. Arrange fasteners and attachments to ensure concealment from view.
- E. Prepare components with internal reinforcement for operating hardware.
- F. Provide internal drainage of glazing spaces to exterior through weep holes.

G. Factory glaze window units.

2-05 FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick; medium bronze.
- B. Apply 1 coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.
- C. Shop and Touch-Up Primer for Steel Components: SSPC-Paint 25.1, zinc oxide, alkyd, linseed oil primer.
- D. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3-02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install window assembly in accordance with AAMA 101.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Install sill and sill end angles.
- F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- G. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.
- H. Install glass and infill panels in accordance with requirements specified in Section 08800.
- I. Install perimeter sealant in accordance with requirements specified in Section 07900.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

- A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E 1105 using uniform pressure and the same pressure difference as specified for laboratory testing.
 - 1. If any window fails, test additional windows at Contractor's expense.
- B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING AND CLEANING

- A. Remove protective material from factory finished aluminum surfaces.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

SECTION 08710

DOOR HARDWARE

PART 1 –	GENERAL
1-01	SECTION INCLUDES
1-02	REFERENCES
1-03	SUBMITTALS
1-04	QUALITY ASSURANCE
1-05	DELIVERY, STORAGE, AND PROTECTION
1-06	COORDINATION
PART 2 – PRODUCTS	
2-01	GENERAL HARDWARE REQUIREMENTS
2-02	GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS
2-03	KEYING
2-04	FASTENINGS
PART 3 –	EXECUTION
3-01	EXAMINATION
3-02	INSTALLATION
3-03	ADJUSTING
3-04	PROTECTION OF FINISHED WORK
3-05	SCHEDULE

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Hardware for wood and hollow steel doors.
- B. Thresholds.
- C. Weatherstripping, seals and door gaskets.

1-02 REFERENCES

- A. ANSI/ICC A117.1 American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.
- B. BHMA A156.1 American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2000 (ANSI/BHMA A156.1).
- C. BHMA A156.7 American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 1988 (R1997) (ANSI/BHMA A156.7).
- D. BHMA A156.9 American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.9).
- E. BHMA A156.15 American National Standard for Closer Holder Release Devices; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.15).
- F. BHMA A156.17 American National Standard for Self Closing Hinges & Pivots; Builders Hardware Manufacturers Association, Inc.; 1999 (ANSI/BHMA A156.17).
- G. BHMA A156.18 American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2000 (ANSI/BHMA A156.18).
- H. BHMA A156.20 American National Standard for Strap and Tee Hinges and Hasps; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.20).
- I. BHMA A156.21 American National Standard for Thresholds; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.21).
- J. DHI A115 Series Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition.
- K. DHI A115W Series Specifications for Wood Door and Frame Preparation for Hardware; Door and Hardware Institute; 2000.
- L. DHI (LOCS) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 1990.
- M. DHI WDHS.3 Recommended Locations for Architectural Hardware for Wood Flush Doors; Door and Hardware Institute; 1993.
- N. NFPA 101 Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2000.

1-03 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts,.
- C. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- D. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
- E. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1-04 QUALITY ASSURANCE

A. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with five years of experience.

1-05 DELIVERY, STORAGE, AND PROTECTION

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1-06 COORDINATION

- A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.
- B. Furnish templates for door and frame preparation.
- C. Coordinate Owner's keying requirements during the course of the Work.

PART 2 - PRODUCTS

2-01 GENERAL HARDWARE REQUIREMENTS

All doors shall be operated by curved return lever handles & touch bar exit devices. Door knobs are NOT acceptable devices. Manufacturers listed are for basis of design only.

- A. Hinges: Exterior: Hager; BB 1191- 4.5"x4.5" NRP; Interior: Hager BB 1279 4.5"x4.5"
 - 1. Hinges shall conform to BHMA A156.1. Hinges used on metal doors and frames shall also conform to BHMA A156.7. Except as otherwise specified, hinge sizes shall conform to the hinge manufacturer's printed recommendations. Hinges shall be a minimum, Heavy-Weight 114.3 mm x 114.3 mm ANSI 5111, five knuckle with four ball bearings, non-rising removable pin with button tip and plug. Base shall be stainless steel or brass for exterior doors. Hinges for reverse bevel doors with locks shall have pins that are made nonremoveable by means such as a set screw in the barrel, or safety stud, when the door is in the

closed position.

- B. Lock and Latch Sets: Corbin Russwin CL3600 Series; Newport
 - 1. To the maximum extent possible, lever handle, locksets, latchsets and deadlocks, and all components thereof, including cylinders and removable cores, shall be the products of a single manufacturer. Lock fronts for double-acting doors shall be rounded. Strikes for wood frames and pairs of wood doors shall be furnished with wrought boxes.
- C. Push/Pulls: Push Rockwood 70C; Pull Rockwood 107 x 70C
 - 1. Door pull and plate shall be Category J407 stainless steel, Grade 1.
 - 2. Push plates shall be Type J301/304, Grade 1, 0.050 inch thick minimum stainless steel beveled four edges.
- D. Weatherstrip: National Guard 110NA x length and width required.
 - 1. Weatherseals shall be located as indicated, snug to door face and fastened in place with color matched metal screws after door and frames have been finish painted. Screw spacing shall be as recommended by manufacturer.
- E. Threshold: National Guard 425 x length.
 - 1. Thresholds shall be secured with a minimum of three fasteners per single door width and six fasteners per double door width with a maximum spacing of 12 inches. Exterior thresholds shall be installed in a bed of sealant with expansion anchors and stainless steel screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4 inch thread engagement into the floor or anchoring device used.
- F. Sweep: National Guard 200NA x length required
- G. Drip Strip: National Guard 16A x FOW plus 100mm.
 - 1. Door sill rain drips shall align with the bottom edge of the door. Overhead rain drips shall align with bottom edge of door frame rabbet. Drips shall be set in sealant and fastened with stainless steel screws.
- H. Mortise Locks: Best Access Systems
 - 1. 35H Series with security head screws.
 - 2. Rose-H trim.
- I. Exit Devices: Dorma 9300 x V103 x CD
 - 1. Exit devices exit device accessories shall conform to BHMA A156.3, Grade 1.
 - 2. Exit Devices and Auxiliary Items Trim shall be of wrought construction and commercial plain design with straight, beveled, or smoothly rounded sides, corners, and edges. Adjustable strikes shall be provided for rim type and vertical rod devices. Open back strikes shall be provided for pairs of doors with mortise and vertical rod devices; except open back strikes shall be used on labeled doors only where specifically provided for in the published listings. Touch bars shall be provided in lieu of conventional crossbars and arms.
- J. Closers: Dorma 7800
 - 1. Door closing devices shall conform to BHMA A156.4, Grade 1. Closing devices shall be products of one manufacturer for each type specified. The

- opening resistance of closing devices shall not exceed 15 1bf applied at the latch stile or exceed 5 1bf where low opening resistance is scheduled.
- 2. Surface type closers shall be Grade 1, Series C01000 with options PT-4C and PT-4D Full Cover with options PT-4H, Size 1 or 2 through Size 6, and PT-4D with back check position valve. Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations.
- 3. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb mounted. Closers for doors close to a wall shall be of narrow projection so as not to strike the wall at the 90-degree open.
- K. Flush Bolts: Hager; Interior 281D
- L. Gasketing: National Guard 5050 x 7'
 - 1. Gasketing shall be installed at the inside edge of the hinge and head and latch sides of door frame. Frames shall be toleranced for a 1/8 inch clearance between door and frame. Frames shall be treated with tape primer prior to installation.
- M. Door Stop: Wall Hager 236; Base Ives 61; Hinge Ives 70.
 - 1. Wall stops, floor stops and combination stop and holders shall conform to BHMA A156.16.
- N. Kick Plates and Mop Plates: Ives 8400 12" x width
 - 1. Kick plates shall be installed on the push side of single-acting doors and on both sides of double-acting doors. Mop plates shall be installed on the pull side of the single acting doors. Conform to ANSI A156.6

2-02 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

- A. Provide products that comply with the following:
 - 1. Applicable provisions of Federal, State, and local codes.
 - 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 - 3. Applicable provisions of NFPA 101, Life Safety Code.
- B. Finishes: Unless otherwise specified, finishes shall conform to those identified in BHMA A156.18. Where painting of primed surfaces is required, painting is specified in Division 9 PAINTING, GENERAL All finishes shall be Satin Chrome.

2-03 KEYING

- A. Door Locks: Grand master keyed.
- B. Supply keys in the following quantities:
 - 1. 5 master keys.
 - 2. 5 grand master keys.
 - 3. 3 change keys for each lock.

2-04 FASTENINGS

A. Fastenings of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete or masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel. Sex bolts, through bolts, or machine screws and grommet nuts, where used on reverse-bevel exterior doors equipped with half-surface or full-surface hinges, shall employ one-way screws or other approved tamperproof screws. Screws for the jamb leaf of half-mortise and full-surface hinges attached to structural steel frames shall be one-way or other approved tamperproof type.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3-02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Mounting heights for hardware from finished floor to center line of hardware item:
 - 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
 - 2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3-03 ADJUSTING

- A. Adjust work under provisions of Section 00800.
- B. Adjust hardware for smooth operation.

3-04 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 00800.
- B. Do not permit adjacent work to damage hardware or finish.
- 3-05 SCHEDULE As per drawings.

SECTION 08800

GLAZING

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SECTION 08800 GLAZING

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

1-02 REFERENCES

- A. ASTM C 864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1999.
- B. ASTM C 920 Standard Specification for Elastomeric Joint Sealants; 1998.
- C. ASTM E 773 Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 1997.
- D. ASTM E 774 Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.
- E. ASTM E 1300 Standard Practice for Determining Load Resistance of Glass in Buildings; 2000.
- F. GANA (GM) GANA Glazing Manual; Glass Association of North America; 1997.
- G. GANA (SM) FGMA Sealant Manual; Glass Association of North America; 1990.

1-03 PERFORMANCE REQUIREMENTS

- A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
 - 1. In conjunction with materials described in Section 08410 and 08520.
 - 2. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.
- B. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.
 - 1. Use the procedure specified in ASTM E 1300 to determine glass type and thickness.
 - 2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 - 3. Thicknesses listed are minimum.

1-04 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Samples: Submit two samples 12 x 12 inch in size of glass units, showing coloration and design.

1-05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1-06 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

1-07 WARRANTY

- A. See Section 00800, for additional warranty requirements.
- B. Provide a five (5) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 - PRODUCTS

2-01 FLAT GLASS MATERIALS

- A. Clear Float Glass: Clear, fully tempered.
 - 1. Comply with ASTM C 1048, Condition A uncoated, Type 1 transparent flat, Class 1, Quality q3 glazing select.
 - 2. 1/4' thick.
- B. Tinted Glass: Float type, tempered, light reducing in grey color.
 - 1. Comply with ASTM C 1048, Condition A uncoated, Type 1 transparent flat, Class 2 tinted heat-absorbing and light reducing, Quality q3 glazing select.
 - 2. 1/4" thick.

2-02 SEALED INSULATING GLASS MATERIALS

- A. Insulated Glass Units: Double pane with glass to elastomer edge seal.
 - 1. Comply with ASTM E 774 and E 773, Class CBA.
 - 2. Purge interpane space with dry hermetic air.
 - 3. Total unit thickness of 1 inch minimum.
- B. Edge Seal Construction: Aluminum, bent and soldered corners.

2-03 GLAZING COMPOUNDS

- A. Butyl Sealant: Single component; Shore A hardness of 10 to 20; black color; non-skinning.
- B. Silicone Sealant: Single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.

2-04 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal.
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C 864 Option I; black color.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3-02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealant in accordance with manufacturer's instructions.
 - E. Installation method is contractor's option as long as it meets the performance criteria above.

3-03 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Trim protruding tape edge.

3-04 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
- G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3-05 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
 - E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3-06 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 24

inch intervals, 1/4 inch below sight line.

- E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.
- 3-07 INSTALLATION INTERIOR WET METHOD (COMPOUND AND COMPOUND)
- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- B. Locate and secure glazing pane using glazers' clips.
- C. Fill gaps between glazing and stops with glazing compound until flush with sight line.

 Tool surface to straight line.

3-08 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.
- 3-09 PROTECTION OF FINISHED WORK
- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.
- 3-10 SCHEDULE
- A. Location of tempered glass will be based on local code requirements.

DIVISION 9 – FINISHES

SECTION 09650

RESILIENT FLOORING

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SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient base.
- C. Installation accessories.

1-02 REFERENCES

- A. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2000.
- B. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2000.
- C. ASTM F 1303 Standard Specification for Sheet Vinyl Floor Covering with Backing; 1999.
- D. ASTM F 1861 Standard Specification for Resilient Wall Base; 2000.
- E. ASTM F 1913 Standard Specification for Vinyl Sheet Floor Covering Without Backing; 1998.
- F. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2000.

1-03 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Selection Samples: Submit manufacturer's complete set of color samples for Contracting Officer's initial selection.
- C. Verification Samples: Submit two samples, 12x12 inch in size illustrating color and pattern for each resilient flooring product specified.
- D. No material shall be ordered until the full size samples have been approved for use. The Contracting Officer has the right to make minor changes in color and pattern upon reviewing actual samples.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1-04 DELIVERY, STORAGE, AND PROTECTION

A. Deliver materials to the job in the manufacturer's original, unopened containers with brands, names, and production runs clearly marked thereon. Handle materials carefully, and store them in their original containers at no less than 65°F for at least 48 hours prior to starting work.

1-05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 - PRODUCTS

2-01 MATERIALS - SHEET FLOORING

- A. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness, and:
 - 1. Minimum Requirements: Comply with ASTM F 1303, Type II, without backing, or ASTM F 1913.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Total Thickness and Wear Layer Thickness: 0.080 inch nominal.
 - 4. Sheet Width: 72 inch minimum.
 - 5. Static Load Resistance: 750 psi minimum, when tested as specified in ASTM F 1303
 - 6. Integral coved base with cap strip.
- B. Vinyl Welding Rod: Solid vinyl bead produced by manufacturer of vinyl flooring for heat welding seams, in color matching field color.

2-02 MATERIALS - BASE

- A. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
 - 1. Height: 4 inch.
 - 2. Thickness: 0.125 inch thick.
 - 3. Finish: Satin.
 - 4. Length: Roll.
 - 5. Color: Color as selected from manufacturer's standards.
 - 6. Accessories: Premolded external corners and end stops.

2-03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Moldings and Edge Strips: Metal.
- D. Filler for Coved Base: Plastic.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive resilient flooring.
- B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive resilient base.
- C. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3-02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3-03 INSTALLATION - SHEET FLOORING

- A. Install in accordance with manufacturer's instructions.
- B. Spread only enough adhesive to permit installation of materials before initial set.
- C. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns carefully at seams.
- E. Double cut sheet; provide heat welded seams.

- F. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Secure metal strips after installation of flooring with stainless steel screws. Secure resilient strips by adhesive.
- H. Coved Base: Install using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.
- I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3-04 INSTALLATION - BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3-05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions. Minimum requirements provide 2 coat sealer and 5 coat polish. Sealer and polish as per manufacturer's recommendation.

3-06 PROTECTION OF FINISHED WORK

A. Prohibit traffic on resilient flooring for 48 hours after installation.

DIVISION 9 – FINISHES

SECTION 09680

CARPET

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SECTION 09680

CARPET

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Carpet, direct-glued.
- B. Accessories.

1-02 REFERENCES

- A. ASTM D 2859 Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 1996.
- B. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2000.
- C. CRI 104 Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 1996.
- D. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2000.

1-03 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1-04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum three years experience.

1-05 ENVIRONMENTAL REQUIREMENTS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 - PRODUCTS

2-01 CARPET

- A. Carpet: Tufted, nylon, conforming to the following criteria:
 - 1. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E 648 or NFPA 253.
 - 2. Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").
 - 3. Surface Appearance: Multi-Level Loop
 - 4. Pattern repeat: None.
 - 5. Roll Width: 12 ft.
 - 6. Gage: 1/8 inch.
 - 7. Stitches: 8.5 per inch.
 - 8. Pile Weight: 28 oz/sq yd.
 - 9. Density Factor: 7429 kilotex.
 - 10. Primary Backing:
 - a. Material: Polypropylene.
 - 11. Secondary Backing:
 - a. Material: Action Bac.

2-02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer.
- B. Adhesives: Compatible with materials being adhered.
- C. Seam Adhesive: Recommended by manufacturer.
- D. Contact Adhesive: Compatible with carpet material; releasable type.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive carpet.
- B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive carpet.
- C. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3-02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Clean substrate.

3-03 INSTALLATION - GENERAL

- A. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104.
- B. Verify carpet match before cutting to ensure minimal variation between dye lots.
- C. Lay out carpet:
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - 2. Do not locate seams perpendicular through door openings.
 - 3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
 - 4. Locate change of color or pattern between rooms under door centerline.
 - 5. Provide monolithic color, pattern, and texture match within any one area.
- D. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3-04 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.

3-05 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

DIVISION 9 – FINISHES

SECTION 09900

PAINTS AND COATINGS

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SECTION 09900

PAINTS AND COATINGS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. See Schedule Surfaces to be Finished, at end of Section.

1-02 REFERENCES

- A. ASTM D 16 Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2000.
- B. ASTM D 4442 Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992 (Reapproved 1997).

1-03 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1-04 SUBMITTALS

- A. See Section 800 for submittal procedures.
- B. Samples: Submit two paper chip samples, 12 x 12 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available.

1-05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1-06 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is

- outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 - PRODUCTS

2-01 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
 - 1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
 - 2. For good flow and brushing properties.
 - 3. Capable of drying or curing free of streaks or sags.

2-02 PAINT SYSTEMS - EXTERIOR

- A. Paint type A Ferrous Metals, Unprimed, Alkyd, 3 Coat:
 - 1. One coat of alkyd primer.
 - 2. Gloss: Two coats of alkyd enamel; .
- B. Paint type B Galvanized Metals, Alkyd, 3 Coat:
 - 1. One coat galvanize primer.
 - 2. Semi-gloss: Two coats of alkyd enamel.
- C. Paint type C Pavement Marking Paint:
 - 1. White: One coat, with reflective particles.

2-03 PAINT SYSTEMS - INTERIOR

- A. Paint type D Wood, Opaque, Alkyd, 3 Coat:
 - 1. One coat alkyd primer sealer.
 - 2. Semi-gloss: Two coats of alkyd enamel.
- B. Paint type E Wood, Transparent, Varnish, Stain:
 - 1. One coat of stain.
 - 2. One coat sealer.
- C. Paint type F Concrete/Masonry, Opaque, Alkyd, 3 Coat:
 - 1. One coat of block filler.
 - 2. Semi-gloss: Two coats of alkyd enamel.
- D. Paint type G Ferrous Metals, Unprimed, Alkyd, 3 Coat:
 - 1. One coat of alkyd primer.
 - 2. Semi-gloss: Two coats of alkyd enamel.
- E. Paint type H Ferrous Metals, Primed, Alkyd, 2 Coat:
 - 1. Touch-up with alkyd primer.
 - 2. Semi-gloss: Two coats of alkyd enamel.
- F. Paint type J Galvanized Metals, Alkyd, 3 Coat:
 - 1. One coat galvanize primer.

- 2. Semi-gloss: Two coats of alkyd enamel.
- G. Paint type K Gypsum Board/Plaster, Alkyd, 3 Coat:
 - 1. One coat of alkyd primer sealer.
 - 2. Eggshell: Two coats of alkyd enamel; for walls.
 - 3. Flat: Two coats of alkyd enamel; for ceiling.

2-04 ACCESSORY MATERIALS

- A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D 4442.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D 4442.
 - 5. Concrete Floors: 8 percent.

3-02 PREPARATION

- A. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

- F. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- G. Asphalt, Creosote, or Bituminous Surfaces to be Painted: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.
- H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- J. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- K. Interior Wood Items to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- L. Interior Wood Items to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- M. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3-03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3-04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to Section 15800 and Section 16010 for schedule of color coding of equipment, duct work, piping, and conduit.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings

removed prior to finishing.

3-05 SCHEDULE - SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically noted.
 - 2. Fire rating labels, equipment serial number and capacity labels.
- B. Paint the surfaces described in PART 2, Paint Systems.
- C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
 - 1. Paint all insulated and exposed pipes, conduit, boxes, and hangers, brackets, collars and supports occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint shop-primed items occurring in finished areas.
 - 3. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - 4. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- D. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3-06 SCHEDULE - PAINT SYSTEMS

- A. Concrete, Concrete Block, Brick Masonry: Finish all surfaces exposed to view.
 - 1. Interior: Type F, semi-gloss.
- B. Gypsum Board: Finish all surfaces exposed to view.
 - 1. Interior Ceilings and Bulkheads: Type K, flat.
 - 2. Interior Walls: Type K, eggshell.
- C. Wood: Finish all surfaces exposed to view.
 - 1. Interior trim and frames: Type D
- D. Wood Doors: Type E.
- E. Steel Doors and Frames: Finish all surfaces exposed to view; Type J, gloss.
- F. Steel Fabrications: Finish all surfaces exposed to view.
 - 1. Exterior: Type A, gloss; finish all surfaces, including concealed surfaces, before installation.
 - 2. Interior: Type J, gloss.

- G. Shop-Primed Metal Items: Finish all surfaces exposed to view.
 - 1. Finish the following items:
 - a. Exposed surfaces of lintels.
 - b. Access ladder.
 - c. Exposed Process Piping.
- H. Exterior Pavement Markings: Type C.

DIVISION 10- SPECIALTIES

SECTION 10100

VISUAL DISPLAY BOARDS

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SECTION 10100

VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Markerboards.
- B. Pegboards.

1-02 REFERENCES

- A. ANSI A208.1 American National Standard for Particleboard; 1999.
- B. ASTM A 424 Standard Specification for Steel, Sheet, for Porcelain Enameling; 2000.

1-03 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Product Data: Provide manufacturer's data on markerboard, pegboard, trim, and accessories.
- C. Samples: Submit color charts for selection of color and texture of markerboard and trim.
- D. Maintenance Data: Include data on regular cleaning, stain removal.

1-04 WARRANTY

- A. See Section 00800, for additional warranty requirements.
- B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 - PRODUCTS

2-01 VISUAL DISPLAY BOARDS

- A. Markerboards: Porcelain enamel on steel, laminated to core.
 - 1. Color: White.
 - 2. Metal Face Sheet Thickness: 0.024 inch (24 gage).
 - 3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
 - 4. Backing: Aluminum foil, laminated to core.
 - 5. Size: As indicated on drawings.
 - 6. Frame: Extruded aluminum, with concealed fasteners.
 - 7. Frame Finish: Baked enamel, Color to be selected from manufacturer's standard colors.
 - 8. Accessories: Provide chalk tray and map rail.

C. Pegboards:

- 1. Size 4 feet high x 15 feet long.
- 2. Frame: Extruded aluminum.

2-02 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A 424, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- D. Foil Backing: Aluminum foil sheet, 0.005 inch thick.
- E. Standards: Single and double slotted aluminum standards.

2-03 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.
- B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- C. Chalk Tray: Aluminum, manufacturer's standard profile one piece full length of chalkboard, molded ends; concealed fasteners, same finish as frame.
- D. Mounting Brackets: Concealed.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3-02 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.
- C. Install aluminum standards for pegboard installation on concrete block walls.
- D. Cut aluminum standards to required length.

3-03 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at date of Substantial Completion.

DIVISION 10 - SPECIALTIES

SECTION 10171

SOLID PLASTIC TOILET COMPARTMENTS

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2-02 SOLID PHENOLIC MATERIALS

2-03 HARDWARE

PART 3 – EXECUTION

3-01 INSTALLATION

SECTION 10171

SOLID PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Solid phenolic toilet compartments.

1-02 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Product Data: Manufacturer's catalog data on panels, pilasters, doors, hardware and fastening.
- C. Color Charts: Manufacturer's complete range of colors.

PART 2 PRODUCTS

2-01 COMPARTMENTS

- A. Toilet Compartments: Solid phenolic.
 - Overhead braced:

2-02 SOLID PHENOLIC MATERIALS

- A. Panels: Solid phenolic core material, compression molded, single piece construction with integral melamine surface and uniformly machined edges; no two-piece construction.
 - 1. Color: As selected from manufacturer's standard colors.
 - 2. Panel Size: Nominal 1/2 inch thick by 58 inches high, of required depth.
- B. Doors: Same design and construction as specified for panels; nominal 3/4 inch thick by 58 inches high.
- C. Pilasters: Same design and construction as specified for panels and doors; nominal 3/4 inch thick.
- D. Panel Anchors: Heavy extruded brite anodized type 6463T5 aluminum.
 - 1. Panels to Pilasters: Three U-brackets.
 - 2. Panels to Wall: Three double ear brackets.
 - 3. Pilasters to Wall: Continuous single ear bracket (panel height).
- E. Overhead Braced: 80 inch high pilasters.
 - 1. Pilaster Floor Anchors: To mount pilasters 2 inches above finish floor; Type 304 stainless steel; 12 gage angle and two 5/16 inch threaded rods with leveling nuts and washers and lead double expansion shields.
 - 2. Top Bracing: Brite anodized aluminum channel 1-1/2 inch by 1 inch of antigrip design to cap top of pilasters and secured on inside of compartment.

- 3. Headrail Brackets: 18 gage stainless steel.
- 4. Conceal floor fasteners with 4 inch high one-piece 20 gage Type 304 stainless steel floor shoe.

2-03 HARDWARE

- A. Hardware: Provide all hardware and fasteners for a complete installation.
- B. Door Hinges: 1/8 inch thick heavy extruded brite anodized type 6463T5 aluminum hinges that wrap around both the door and pilaster.
 - 1. Solid Phenolic: Fasten hinges to door and pilaster with one-way head thrubolts.
 - 2. Top Hinges: Opposing nylon cams factory set at 30 degrees open for in-swing and closed for out-swing.
 - 3. Reinforce top hinge with a 1/4 inch stainless steel rod.
- C. Strike-Keeper and Throw Latch: 16 gage formed Type 304 stainless steel strike-keeper with rubber stop and cast stainless steel slide bar and knob that does not require gripping or turning, brushed finish.
- D. Coat Hook and Wall Bumper: Heavy chrome-plated Zamac fastened with 5/8 inch stainless steel tamper-proof screws.
- E. Fasteners:
 - 1. Tamper-Proof: "Pro-Star".
 - 2. Floor and wall fasteners: No. 14 by 1-3/4 inch tamper-proof screws with conical plastic anchors.
 - 3. All other fasteners: 5/8 inch stainless steel tamper-proof screws or chrome plated brass tamper-proof brass thru-bolts.

PART 3 EXECUTION

3-01 INSTALLATION

- A. Install partitions rigid, straight, plumb and level in accordance with manufacturer's instructions.
- B. Set units with not more than 1/2 inch between pilasters and panels and not more than 3/4 inch between panels and walls.
- C. Overhead-Braced: Secure to structural concrete floor.
- D. Adjust and lubricate hardware for proper operation after installation.
 - 1. Set hinges on in-swing doors to hold doors in the open or closed position when unlatched as shown on drawings.
 - 2. Set hinges on out-swing doors to return to the fully closed position.
 - 3. Remove protective plastic coating.

DIVISION 10- SPECIALTIES

SECTION 10446

PLASTIC SIGNS

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PLASTIC SIGNS

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Dimensional letters.

1-02 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

1-03 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Shop Drawings: Indicate sign styles, lettering font, colors, locations, overall dimensions of each sign.
- C. Samples: Submit 1 sample of letter illustrating type, style, letter font and color specified; method of attachment

1-04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

PART 2 - PRODUCTS

2-01 DIMENSIONAL LETTERS

- A. Cut letters from 1/2 inch thick solid metal.
- B. Produce precisely cut characters with square cut, and smooth edges.
- C. Each letter shall be pin mounted to the wall. Coordinate concealed blocking requirements.
- D. Letter Height: 6"
- E. Style: Helvetica
- F. Finish: To be selected from manufacturer's standard colors.

2-02 MOUNTING

A. Provide threaded studs and spacers for projected mounting of the dimensional letters. Distance from back of letter to finish wall surface to be 3/8".

PART 3 - EXECUTION

- 3-01 EXAMINATION
- A. Verify that substrate surfaces are ready to receive work.
- 3-02 INSTALLATION
- A. Install in accordance with manufacturer's instructions.
- 3-03 SCHEDULES
- A. Signage at Administration Building to read "ADMINISTRATION BUILDING"
- B. Signage at Solids Handling Building to read "SOLIDS HANDLING BUILDING"

DIVISION 10- SPECIALTIES

SECTION 10500

LOCKERS

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LOCKERS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Locker units with hinged doors.
- B. Metal tops and filler panels.

1-02 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.

1-03 DELIVERY, STORAGE, AND PROTECTION

A. Protect locker finish and adjacent surfaces from damage.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance with applicable sections of Division 00800, showing materials of construction and details of installation for:
 - 1. Complete description of all materials.
 - 2. Certified shop and installation Drawings showing all details of construction, dimensions, and anchor bolt locations.
 - 3. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 4. A complete bill of materials.
 - 5. The weight(s) of each component.
 - 6. Description of surface preparation and shop painting of components and accessories.
- B. In the event it is not possible to conform with certain details of the Specifications, describe completely all non-conforming aspects.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Sheet Steel: ASTM A 653/A 653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; to the following minimum thicknesses:
 - 1. Body and Shelf: 24 gage, 0.024 inch.
 - 2. Door Outer Face: 18 gage, 0.048 inch.
 - 3. Door Inner Face: 20 gage, 0.036 inch.
 - 4. Door Frame: 16 gage, 0.060 inch.
 - 5. Hinges: 14 gage, 0.075 inch.
 - 6. Base: 20 gage, 0.036 inch.
 - 7. Sloping Top: 20 gage, 0.036 inch.

- 8. Trim: 20 gage, 0.036 inch.
- B. Accessories For Each Locker: Two single prong wall hooks, coat hanger bar.

2-02 LOCKER UNITS

- A. Width: 9 inches.
- B. Depth: 12 inches.
- C. Height: 72 inches.
- D. Configuration: double tier.
- E. Mounting: Surface mounted.
- F. Base: Metal base.
 - 1. Base Height: 4 inch.
- G. Top: Sloped metal with closures.
- H. Locking: Equipped for combination locks.
- I. Ventilation Method: Door louvers.
- J. Class: Quiet.
- K. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
- L. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
- M. Doors: Hollow sandwich construction, 1 3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
- N. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.
- O. Locking device supplied by Owner.
- P. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1 inch high of block font style with ADA designation, in contrasting color.
- Q. Provide ventilation openings at top and bottom of each locker.
- R. Form recess for operating handle and locking device.
- S. Finish edges smooth without burrs.
- T. Fabricate sloped metal tops, ends and closure pieces.
- U. Provide end panels and filler strips.

2-03 FINISHING

- A. Clean, degrease, and neutralize metal; prime and finish with two coats of baked enamel.
- B. Paint locker bodies and doors in contrasting colors.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

3-02 CLEANING

A. Clean locker interiors and exterior surfaces.

DIVISION 10- SPECIALTIES

SECTION 10523

FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

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FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.
- 1-02 REFERENCES
- 1-03 SUBMITTALS
- A. See Section 00800, for submittal procedures.
- B. Product Data: Provide color and finish.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

PART 2 - PRODUCTS

2-01 FIRE EXTINGUISHERS

- A. Dry Chemical Type: Stainless steel tank, with pressure gage.
 - 1. Class 2A-10BC.
 - 2. Size 10.
 - 3. Size and classification as scheduled.
 - 4. Finish: Baked enamel, color as selected.

2-02 FIRE EXTINGUISHER CABINETS

- A. Metal: Formed aluminum.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Sized to accommodate accessories.
 - 2. Trim: Returned to wall surface, with 2-1/2 inch projection.
 - 3. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch. Flush pull handle.
- D. Door Glazing: Full glass, clear, 1/8 inch thick tempered. Set in resilient channel gasket glazing.

- E. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- F. Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- H. Finish of Cabinet Interior: White enamel.
- 2-03 ACCESSORIES
- A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 - EXECUTION

- 3-01 EXAMINATION
- A. Verify rough openings for cabinet are correctly sized and located.
- 3-02 INSTALLATION
- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, and as recommended by manufacturer from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.
- 3-03 SCHEDULES
- A. Corridor 107, Lab 109: Extinguishers in cabinets.
- B. Shop/ Maint. 112, Electrical 102: Wall mounted extinguishers.

DIVISION 10- SPECIALTIES

SECTION 10800

TOILET, BATH, AND LAUNDRY ACCESSORIES

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TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Accessories for toilet rooms, showers, and utility rooms.
- B. Grab bars.

1-02 REFERENCES

- A. ASTM A 269 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2000.
- B. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- C. ASTM A 666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2000.
- D. ASTM C 1036 Standard Specification for Flat Glass; 1991 (Reapproved 1997).
- E. GSA CID A-A-3002 Mirrors, Glass; U.S. General Services Administration; 1996.

1-03 SUBMITTALS

A. See Section 00800, for submittal procedures. See Plan Sheet AP1.02 for items requiring submittals.

1-04 COORDINATION

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Accessories General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Stainless Steel Sheet: ASTM A 666, Type 304.
- C. Stainless Steel Tubing: ASTM A 269, Type 304 or 316.
- D. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, with G90/Z275 coating.
- E. Mirror Glass: Float glass, Type I, Class 1, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance

- with GSA CID A-A-3002.
- F. Adhesive: Two component epoxy type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2-02 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2-03 TOILET ROOM ACCESSORIES

- A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, chrome-plated zinc alloy brackets, spindleless type for tension spring delivery designed to prevent theft of tissue roll.
 - 1. Attached Purse Shelf: 0.03 inch satin finished stainless steel, with rolled or formed edge at front.
- B. Combination Towel Dispenser/Waste Receptacle: Recessed flush with wall, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors.
 - 1. Waste receptacle liner: Reusable, heavy-duty vinyl.
 - 2. Towel dispenser capacity: 400 C-fold.
 - 3. Waste receptacle capacity: 4 gallons.
- C. Soap Dispenser: Liquid soap dispenser, deck-mounted on vanity, with polyethylene container concealed below deck; piston and 4 inch spout of stainless steel with bright polished finish; chrome-plated deck escutcheon.
 - 1. Minimum Capacity: 16 ounces.
- D. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
 - 1. Size: As indicated on drawings.
 - 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
 - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
- E. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on drawings.
- F. Combination Sanitary Napkin/Tampon Dispenser: Stainless steel, surface-mounted.
 - 1. Door: Seamless 0.05 inch door with returned edges and tumbler lock.
 - 2. Cabinet: Fully welded, 0.03 inch thick sheet.
 - 3. Operation: 25 cent coin required to operate dispenser. Provide locked coin box, separately keyed.
 - 4. Minimum capacity: 15 napkins and 20 tampons.

G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2-04 SHOWER AND TUB ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satinfinished stainless steel flanges, for installation with exposed fasteners.
- B. Shower Curtain: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 1. Size: 42 x 72 inches, hemmed edges.
 - 2. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 - 3. Color: As selected from manufacturer's standard colors.
 - 4. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- C. Towel Pin: Stainless steel, 3 inch extension from wall; rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2-05 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: 3, 0.06 inch stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
 - 4. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify existing conditions before starting work.
 - B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3-02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3-03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings.

DIVISION 11- EQUIPMENT

SECTION 11450

RESIDENTIAL EQUIPMENT

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RESIDENTIAL EQUIPMENT

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Kitchen appliances.

1-02 REFERENCES

A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1-03 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1-04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1-05 WARRANTY

- A. See Section 00800, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 - PRODUCTS

2-01 KITCHEN APPLIANCES

- A. Refrigerator: Free-standing, top-mounted freezer, frost-free.
 - 1. Capacity: Total minimum storage of 20 cubic ft; minimum 15 percent freezer capacity.
 - 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by DOE.
 - 3. Features: Include glass shelves and automatic icemaker.
 - 4. Finish: Porcelain enameled steel, color as indicated.

- B. Dishwasher: Undercounter.
 - 1. Controls: Solid state electronic.
 - 2. Wash Levels: 3.
 - 3. Cycles: 4, including normal.
 - 4. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, and adjustable lower rack.
 - 5. Finish: Porcelain enameled steel, color as indicated.

PART 3 - EXECUTION

- 3-01 EXAMINATION
- A. Verify utility rough-ins are present and correctly located.
- 3-02 INSTALLATION
- A. Install in accordance with manufacturer's instructions.
- 3-03 ADJUSTING
- A. Adjust operating equipment to efficient operation.
- 3-04 CLEANING
- A. Remove packing materials from equipment.
- B. Wash and clean equipment.

DIVISION 11- EQUIPMENT

SECTION 11600

WASTEWATER LABORATORY EQUIPMENT

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WASTEWATER LABORATORY EQUIPMENT

PART 1 - GENERAL

1-01 SCOPE OF WORK

- A. The Contractor shall furnish and install all items of equipment specified herein. The intent of this Specification is to provide the Owner with the necessary equipment to operate a properly equipped and functioning laboratory for the purposes of analyzing and reporting the various parameters required in wastewater treatment. All equipment shall new and unused.
- B. The manufacturers listed herein are intended to provide a general guide to establish a base line of quality acceptable to the Contracting Officer. Should the Contractor elect to provide a piece of equipment manufactured by a company other than those indicated below, such equipment shall be submitted for approval to the Contracting Officer. It shall be the responsibility of the Contractor to provide an acceptable item of equipment. In the event the proposed equipment is not acceptable, the Contractor shall submit an item that is acceptable at no additional cost to the Government.
- C. Should equipment other than that specified be proposed, the Contractor shall be responsible for any redesign based on the requirements contained herein.
- D. Should specified equipment models no longer be available from the specified manufacturer, the Contractor shall furnish a model the manufacturer certifies to be at least an equivalent model as a substitute at no additional cost.

PART 2 - PRODUCTS

2-01 REQUIRED EQUIPMENT

A. The following equipment shall be furnished and installed in accordance with the Drawings and Specifications. Detailed installation requirements shall be the responsibility of the Contractor.

COMPANY	QTY	DESCRIPTION	CAT #
VWR	2 case	BOD Bottles (1 – 24)	16285-114
НАСН	2	BOD Bottles – PK/24	621-24
НАСН	8	BOD Bottle Cap Pk/6	2419-06
НАСН	2	BOD Bottle Rack	20942-01
VWR	2	4L Carboy Bottle	16333-068
VWR	1	Precision Model 851 4CF BOD Incubator	35960-056
YSI	1	BOD Self Stirring Probe	5905
VWR	2	Model 50B YSI DO Meter	54256-121
HACH	1	Automatic Self Zeroing Buret	22614-40
HACH	3	Magnetic Filter Holder	13529-00
VWR	1	Economy Oven	52201-297
VWR	2	1000ML Filter Flask	29410-983
VWR	1	Vacuum Pump	54906-001
VWR	10	Glass Fiber Filters	28150-190
VWR	1	Smooth 70 ML Alum Dishes – Pk/100	25433-089
VWR	1	Vacuum Gauge	31746-041
VWR	1	Mettler Toledo Balance Model AG104	11274-452
VWR	1	Marble Balance Stand	12568-006
VWR	1	3 Place Vacuum Manifold	28145-349
VWR	1	Forceps Pk/5	25681-269
VWR	1	Vacuum Dessicator	24987-004
VWR	1	Desiccator Plate	25038-003
VWR	1	Desiccant 1.5 lb	26668-109
HACH	10	710ML Whirl Pack Sterile Bags	14372-97
НАСН	2	100 Dishes with Pads	14717-99
НАСН	1	Membrane Filter w/Grid Pk/200	13530-01
VWR	1	Sample Bottles PK/12	16126-063
VWR	3	Thermometer	61010-020
VWR	1	Fecal Coliform Water Bath	13309-435
VWR	1 CS	CN Membrane Filters, 100/case	28160-458
VWR	1	Thermometer -20 to 110C	61016-026
VWR	1	Stainless Bath Cover	13309-941
НАСН	2 PK	Pipet Serological Sterile 1 ml	20926-25
НАСН	2 PK	Pipet Serological Sterile 10 ml	20926-28
НАСН	1	Tensette Pipet 1 ml to 10 ml	19700-10
НАСН	2 PK	Pipet tips for 19700-10	25589-96
НАСН	1	Illuminator, Fluorescent	23175-00
VWR	1	Forceps, 5/pk	25681-269
VWR	2	First Aid Kit	56612-806
VWR	1	General Laboratory Refrigerator	55703-076
VWR	1	Certified Thermometer	61054-649
VWR	8	Lab Thermometer	61030-232
VWR	1	Drying Rack	60995-955

COMPANY	QTY	DESCRIPTION	CAT #
HACH	6	Brush	685-00
HACH	6	Brush	690-00
HACH	6	Brush	687-00
VWR	1	Brush-Flask & bottle 12/pk	17155-001
VWR	1	Brush-Volumetric Flask (5 pk)	17145-041
VWR	1	Brush-Beaker and Jar	17190-002
VWR	1 pk	Bottle Brushes, 6/pk	17066-058
VWR	1 CS	Pipets - 1 ml 12/case	53204-315
VWR	1 CS	Pipets - 5 ml 12/case	53204-392
VWR	1 CS	Pipets - 10 ml 12/case	53204-417
НАСН	1	Pipet - 10ml Widemouth	24897-38
VWR	2	Pipet Filler	53497-053
НАСН	3	Pipet Bulb	14651-00
HACH	1	Pipet Rack	20947-00
VWR	1	Pipet Washer	53582-008
НАСН	1	Pipet Helper (0.1-100ML)	24892-00
НАСН	1	Crucible Tongs	569-00
HACH	1	Binocular Microscope	24970-00
VWR	1	Microscope slides – pk/144	48300+025
VWR	1	Cover Slips	48368-040
НАСН	2	Parafilm	2517-64
HACH	1	Stopcock Grease	562-75
НАСН	1	10G Certified Weight	26176-12
НАСН	1	AMSCO Eagle Ten plus Autoclave	24630-00
НАСН	2	Scoopula	12257-00
НАСН	1	Watchglass	578-70
НАСН	5	Pinch Clamp	633-17
НАСН	2	Glass Funnel	549-68
НАСН	4	Wash Bottles	620-11
VWR	4	Graduated Cylinder - 25 ml	24710-317
VWR	10	Graduated Cylinder - 100 ml	24710-339
VWR	2	Graduated Cylinder - 500 ml	24712-163
VWR	1	Graduated Cylinder - 1000 ml	24774-127
VWR	4	Volumetric Flask - 250 ml	29621-123
VWR	4	Volumetric Flask - 500 ml	29621-145
VWR	2	Volumetric Flask - 1000 ml	29621-167
VWR	4	Erlenmeyer Flask - 500 ml PK/6	29136-081
VWR	2	Beaker - 250ML - pk/12	13913-447
VWR	2	Beaker - 600ML - pk/6	13913-469
VWR	2	Magnetic Stirrer - 7"x7"	58939-884
VWR	6	Stir Bars	58948-985
VWR	1	Rubber Tubing –50 ft.	62995-721
US FILTER	1	Deionized Water Cartridge System	
			l

COMPANY	QTY	DESCRIPTION	CAT #
VWR	1	Megapure Water Still-Barnstead MP-1	26293-017
VWR	4	10L carboy w/handles & spigot	16101-404
НАСН	3	NH3N Ionic Strength Adj Pillows - PK/100	44471-69
НАСН	1	Ammonia Analysis Package	23487-00
HACH	6	Teflon Stir Bar	20953-48
HACH	1	Electrode Stand w/Stirrer	45300-01
НАСН	1	ORP Electrode	50230-00
VWR	1	DO Probe & Cable	5739/5740
HACH	2	Sension 2 IES meter	5172513
VWR	1	Nalgene Settlometer Kit	66185-009
VWR	2	100 Hr Timer	62344-756
HACH	1	COD Reactor	45600-00
НАСН	1 Pk	High Range (0-1500), 150 Pk	21259-15
HACH	1 Pk	Low Range (0-150), 150 Pk	21258-15
HACH	1	COD Reactor Thermometer	45655-00
HACH	1	DR/890 Colorimeter	48470
VWR	1	Fume Hood- 48"L x 54"Hx35.3D	VF5-5448-80
VWR	1	Work Top - for Fume Hood	VF5-0204-A8
VWR	1	Fan for Fume Hood	VF5-3301-B2
		dependent Duct Length 25 ft	
VWR	1	Cup Sink for Fume Hood	VF-0491-00
VWR	1	Base Cabinet (Acid Storage) – for Fume Hood 35"Hx22"Dx48"W	VFG-ACID 48

2-02 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures

PART 3 - EXECUTION

3-01 INSTALLATION

A. All equipment shall be installed in the vicinity of locations indicated on the Drawings. All equipment shall be installed in accordance with manufacturer's recommendations. All materials, labor, and incidental items required to complete the installation of all proposed equipment shall be included in the Contractor's Bid. No additional compensation will be considered to complete the installation of the equipments specified herein.

DIVISION 12- FURNISHINGS

SECTION 12311

METAL CASEWORK

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METAL CASEWORK

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Metal Cabinets and bases.
- B. Counter tops.
- C. Casework hardware.
- D. Service fittings and outlets.

1-02 REFERENCES

- A. ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 1984 (R1994).
- B. ASTM D3363-74 Specifications for Hardness of Paint
- C. ASTM D2794-69 Specifications for Impact Resistance
- D. ASTM D522-60 Specifications for Flexibility
- E. CS 10 Wheel Tabor Abrasor Specification for Abrasion Test.
- F. ASTM D2247 Specification for exposure with no loss of adhesion or blistering.
- G. ASTM B117-64 and ASTM D1654-79 Specification for rust creep.
- H. ASTM C 1048 Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass: 1997b.

1-03 DESIGN REQUIREMENTS

- A. All casework has a "flush surface" design and is built in accordance with the standard of construction for the metal laboratory industry.
- B. All base and storage cabinets have an integral base with a toe space that is 4" high and 3" deep. This integral base allows each cabinet to be used as a single stand-alone unit or in a group.
- C. All units, excluding hardware, are painted or plated whether it is an exposed surface or not. The paint used is a chemically resistant baked on epoxy powder coat enamel.

1-04 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Product Data: Provide component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.
- C. Shop Drawings: Indicate casework locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances

- required.
- D. Samples: Submit two samples, minimum size 6x6 inch of color of base metal, or other finish.
- E. Samples: Submit two, 6x6 inch of countertop material.

1-05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1-06 DELIVERY, STORAGE, AND PROTECTION

A. Accept casework on site. Inspect on arrival for damage.

1-07 PROJECT CONDITIONS

A. Coordinate casework installation with size, location and installation of service utilities.

PART 2 - PRODUCTS

2-01 MATERIALS

- A. Sheet Steel: Mild, cold rolled and leveled unfinished steel.
- B. Gage specifications for individual steel parts shall be as follows:

1.	Aprons	18 Ga.
2.	Back Panels	20 Ga.
3.	Bottom Panels	18 Ga.
4.	Door & Drawer Outer Pan	20 Ga.
5.	Door & Drawer Inner Pan	20 Ga.
6.	Drawer Bodies	20 Ga.
7.	Legs, 2" Square Tube	18 Ga.
8.	Shelves	18 Ga.
9.	Side Panels	18 Ga.
10.	Table Frames	18 Ga.
11.	Shelf Support Brackets	14 Ga.

- C. Safety Glass: ASTM C 1048, fully tempered using horizontal tempering and complying with ANSI Z97.1; 4 mm thick minimum; exposed edges ground, and cut or drilled to receive hardware.
- D. Counter Tops, Back Splash, and Side Splash: Modified epoxy resin, acid resistant.Basis of design: Trespa Toplab SSC (Single Sided Crystal) by Trespa North America, 800-487-3772.
- E. Service Fittings and Fixtures: Brass with epoxy powder coat finish.

2-02 HARDWARE

- A. Hardware: Manufacturer's standard.
- B. Shelf Standards and Rests: Vertical chrome steel standards with rubber button fitted

- steel rests. Vertically adjustable at 1" increments.
- C. Shelf Brackets: Vertical chrome steel standards with chrome steel arms.
- D. Sliding Shelf: Nylon track with solid bearing followers.
- E. Drawer and Door Pulls: Chrome handles on 4 inch centers.
- F. Cabinet Locks: Lock with 4 pin cylinder and 2 keys per lock on each cabinet and drawer.
- G. Catches: Plated, friction, roller type.
- H. Drawer Slides: Zinc plated full extension arm with ball bearings; 10,000 cycles at 100 lbs.
- I. Hinges: Five-knuckle stainless steel fastened both to the door and cabinet frame with zinc plated steel screws.
- J. Sliding Door Track Assemblies: Nylon track with solid bearing followers.

2-03 FABRICATION - MILLWORK

- A. Fabricate casework, assembled and welded.
- B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
- C. Fabricate components of die formed sheet steel. Form each unit rigid, not dependent on building structure for rigidity.
- D. Fabricate drawer bodies fully coved on all four sides horizontally and formed out of one sheet of steel.
- E. Four corners of cabinets to be fitted with a stamped and welded 14 gage leveling gusset plate and a plated leveling screw.
- F. Provide leveling screws with slot for easy adjustment and non-marking nylon glides.
- G. Provide movable metal pan at bottom of all cabinets.
- H. Form edges and seams to be smooth. Form material for facing and shelves from continuous sheets.
- I. Turn down edges of shelves 1 inch on each side and return 5/8 inch front and back.
- J. Electric spot weld casework; grind joints smooth and flush.
- K. Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware. Fill with sound deadening core.
- L. Set glass in doors with gasket and removable stops to minimize rattles or vibration.
- M. Cut and drill counter tops, backs, and other components for service outlets and fixtures.
- N. Install fixtures and fittings built into or part of casework. Provide removal back panels for maintenance of utility service and mechanical and electrical components on all cabinets.
- O. Provide wall hanger brackets for all wall units.

2-04 FABRICATION - COUNTERTOP

- A. Drip grooves shall be provided on the underside at all exposed edges unless otherwise noted.
- B. All exposed edges to be sanded to a smooth finish and, except as indicated below, shall be rounded to a 1/4" radius at front top edge and at vertical corners.
- C. Fix work surface panels with blind fastenings into the back or underside of the panel. Use #10, type A sheet metal screws sized to stop at least 1/8" short of the finished face.
- D. Pre-drill panel with an 11/64" diameter high speed drills bit aligned with 7/32" clearance holes in the supporting structure.
- E. Form tight-fitting butt joints in the work surface using mechanical fasteners positioned to be concealed after installation.
- F. Curbs shall be bonded to the top of the work surface to form a square joint. Joints between sections of curb shall be stepped or mitered as necessary to minimize the amount of black core exposed.
- G. Cutouts for drop-in sinks shall be routed to form openings with 3/8" minimum depth supporting flanges and such that the rim of the sink when installed is at the same level as the work surface top.
- H. Epoxy sinks shall be set in beds of epoxy adhesive.
- I. Cutouts for under-mounted sinks shall be routed and sanded to form smooth edged openings with the top edge radiused to approximately 1/8". The bottom edge of the sink opening shall be finished smooth with the edge broken to prevent sharpness. Corners of sink cutouts shall be radiused not less than 3/4". Under-mounted sinks shall be supported by brackets blind -fixed to the underside of the work surface.

2-05 SOURCE QUALITY CONTROL - MILLWORK

A. Description:

- 1. Surface A: Most critical of all areas. Completely exposed surface. No defects allowed.
- 2. Surface B: Not as critical as surface "A" Sometimes exposed interior and exterior surface.
- 3. Surface C: Hidden surfaces; areas that will not be seen in normal use.

4.	* *	Min. Millage	Surface Class
	Fillers		
	Front of Cabinet or Case	1.2	Α
	Including Drawer and Door		
	Fronts		
	Shelf Tops	1.2	В
	Top of Wall and Floor Case	1.2	В
	Cabinet and Case Floors	1.2	В
	All other than above interior	1.0	В
	and exterior vertical surface		
	All other than above unexposing surfaces	ed 0.75	С
	Surfaces		

B. Non Working Surfaces

1.	Condition	Surface "A"	Surface "B"	Surface "C"
	Blemish	No	Not permitted on surfaces easily	Yes
			detected from an	
			arm's length	
	Water Spot	No	Not permitted on surfaces easily	Yes
			detected from an	
			arm's length	
	Sag	No	Slight	Yes
	Over Cure	No	No	Yes
	Under Cure	No	No	Yes

2-06 SOURCE QUALITY CONTROL - COUNTER TOP

- A. Panels shall be of material specifically designed for laboratory work surfaces. Fabricated work surfaces shall comply with all current codes and regulations. Tops and shelves shall have uniform thickness (+0.03") and flatness (maximum difference of 0.03") for 10 foot span.
- B. Panels to be UL registered and labeled for quality consistency.
- C. Chemical Resistance: Evaluation of chemical resistance is based on SEFA's (Scientific Equipment and Fixture Association) standard list of 49 chemicals/ concentrations, their required methods of testing and their minimum acceptable results as a means of establishing a minimum acceptable level of performance for all exposed and semi-exposed surfaces.
- D. Panels to have screw pull-out strength minimums per following chart (lbs.):

Screw Depth: #6 #8 #10 #12 1/4" 5/16" 3/8" 7/16" 1/2" 1/2" panels: 250 790 300 340 390 450 560 680 900 5/8" panels: 310 370 430 490 560 710 850 990 1,100 3/4" panels: 510 590 680 850 1,0001,200 1,400

E. Uniform load to cause no more than 1/4" deflection at center of the span:

Thickness: 12"x24" 12"x36" 12"x48" 24"x36" 1/2" panels: 370 110 45 450 5/8" panels: 690 370 85 410 3/4" panels: 1,400 400 170 800 1" panels: 2,600 780 330 1,500

- F. Performance requirements:
 - 1. Modulus of elasticity: 1,5000,000 psi minimum.
 - 2. Shear strength: 2000 psi minimum.
 - 3. Compressive strength: 24,000 psi minimum.
 - 4. Weight: 93 lbs. per cubic foot maximum.
 - 5. Flame spread (ASTM E-84): Class 1A (25).
 - 6. Non-porous surface and edges.
 - 7. Will not support micro-organic growth.

2-07 FINISHES

- A. Metal (Except Stainless Steel): Degrease and phosphate etch followed by primer; minimum two coats baked epoxy; color as selected.
- B. The material used is applied in multiple coating where needed without between coat sanding. The shelf life of the material is six months at not more than 77 degrees Fahrenheit without deterioration of properties.
- C. Shop finish all components.
- D. Coat metal surfaces in contact with cementitious materials with bituminous paint.
- E. Appearance:
 - 1. Color: Shall be selected from manufacturers standard colors.
 - 2. Light Resistant: QUV A Apparatus; 48 hours without change in color or glass
 - 3. Thickness: 30 Degree + 5 Matte mill gage
 - 4. Glass: ASTM D523-8060; 20 degree + 5 Black
- F. Performance:
 - 1. Hardness: ASTM D3363-74;

PART 3 - EXECUTION

- 3-01 EXAMINATION
- A. Verify adequacy of support framing and anchors.
- 3-02 INSTALLATION
- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Insulate to prevent electrolysis between dissimilar metals.
- E. Scribe to abutting surfaces and align adjoining components. Apply matching filler pieces where casework abuts dissimilar construction.
- F. Field weld joints in stainless steel work, without open seams. Grind smooth and polish to match adjacent surfaces.
- G. Close ends of units, splash aprons, shelves and bases with sealant.
- H. Field touch-up blemishes to original finish.
- 3-03 ADJUSTING
- A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.
- 3-04 CLEANING
- A. Clean casework, counters, shelves, glass, legs, hardware, fittings and fixtures.
- 3-05 PROTECTION OF FINISHED WORK
- A. Do not permit finished casework to be exposed to continued construction activity.

DIVISION 13- SPECIAL CONSTRUCTION

SECTION 13121

PRE-ENGINEERED BUILDINGS

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PRE-ENGINEERED BUILDINGS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Pre-engineered, shop-fabricated structural steel building frame.
- B. Fabrication and erection of the pre-engineered building system.
- C. Metal wall and roof panels including soffits and gutters and downspouts.
- D. Exterior doors, windows, overhead doors, and louvers.

1-02 REFERENCES

- A. AISC S335 Specification for Structural Steel Buildings--Allowable Stress Design, Plastic Design; American Institute of Steel Construction, Inc.; 1989.
- B. AISC S342L Load and Resistance Factor Design Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 1999.
- C. ASTM A 153/A 153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2000.
- D. ASTM A 307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2000.
- E. ASTM A 325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2000.
- F. ASTM A 325M Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 2000.
- G. ASTM A 500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1999.
- H. ASTM A 501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 1999.
- I. ASTM A 529/A 529M Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2000.
- J. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- K. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.
- L. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1998.
- M. AWS D1.1 Structural Welding Code Steel; American Welding Society; 2002.
- N. MBMA (LR) Low Rise Building Systems Manual; Metal Building Manufacturers

- Association; 1996, with Rev 1 (4/97).
- O. SSPC-Paint 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1982 (Ed. 2000).
- P. UL 580 Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; 1994.

1-03 DESIGN REQUIREMENTS

- A. Installed Thermal Resistance of Wall System: R value of 13.
- B. Installed Thermal Resistance of Roof System: R value of 19.
- C. Design members to withstand dead load, applicable snow load, seismic loads and design loads due to pressure and suction of wind calculated in accordance with applicable code or the "Design Practices Manual," (MBMA), whichever produces the greatest member stresses.
 - 1. Dead Load: Actual weight per manufacturer's design applied to horizontal projection.
 - 2. Collateral loads as shown on drawings.
- D. Design members to withstand UL 580 Uplift Class 90.
- E. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/90 of span.
- F. Roof Covering: Roof covering shall be designed for either 20 psf uniformly distributed or a 250 pound concentrated (point) load over a 1'x1' area located at center of maximum roofing (panel) span or snow drift load. The most severe condition shall govern.
- G. Combination of Loading: Apply loads on component members according to the applicable codes, including auxiliary loads where applicable, and according to Metal building Manufacturers' Association "Design Practices Manual." Design members using such combination of loads resulting in the most critical condition.
- H. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.
- I. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 40 degrees F.
- J. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.
- K. Design gutters and downspouts for rainfall intensity of eight inches per hour in a five minute period.
- L. Structural system shall not be designed with fixed based columns.
- M. The roof decking shall not be used for diaphragm action to resist lateral and transfer loads.

1-04 SUBMITTALS

- A. See Section 00800, for submittal procedures.
- B. Product Data: Provide data on profiles, component dimensions, fasteners.
- C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections and attachments; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, load combinations at each column such as to produce the maximum and minimum loads on the foundations; show the individual loads (including live load reductions) which compromise the total load combination; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.
- D. Submit complete drawing index and written description of drawing numbering system.
- E. Any discrepancies between the drawings, specifications and the building manufacturer's standard conditions shall be brought to the attention of the Engineer immediately.
- F. Samples: Submit two samples of precoated metal panels for each color selected, 12x12 inch in size illustrating color and texture of finish.
- G. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.
- H. Project Record Documents: Record actual locations of concealed components and utilities.

1-05 QUALITY ASSURANCE

- A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
 - 1. Conform to applicable code for submission of design calculations as required for acquiring permits.
 - 2. Cooperate with regulatory agency or authority and provide data as requested.
- B. The intent of these specifications and drawings is to establish a quality and performance level for structural design, material, durability and workmanship.
- C. Perform work in accordance with AISC "Specification for Structural Steel Buildings-Allowable Stress Design, Plastic Design" and AISC "Load and Resistance Factor Design Specification for Structural Steel Buildings".
 - 1. Must be AISC-MB certified.
- D. Perform welding in accordance with AWS D1.1.
- E. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- F. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years experience of the specific manufacturer of the type and size specified.
- G. Manufacturer's standard components may be used, providing components, accessories

and complete structure conform to architectural design appearance as shown and to specified requirements.

1-06 WARRANTY

- A. See Section 00800, for additional warranty requirements.
- B. Provide 20 year manufacturer warranty for durability of roof panels against rupture, structural failure or perforation.
- C. Provide 10 year single source coverage for weather tightness of building enclosure elements after installation.
- D. Provide 5 year manufacturer warranty for exterior pre-finished surfaces to cover pre-finished color coating against chipping, cracking or crazing, blistering, peeling, chalking, or fading.

PART 2 - PRODUCTS

2-01 PRE-ENGINEERED BUILDING

- A. Clear span rigid frame.
- B. Bay Spacing: As indicated on drawings.
- C. Primary Framing: Rigid frame of rafter beams and columns, braced end frames and end wall columns, and wind bracing.
- D. Secondary Framing: Purlins, Girts, Eave struts, Flange bracing, Sill supports, and Clips, and other items detailed.
- E. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, insulation, and liner sheets, and accessory components.
- F. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly and insulation, and accessory components.
- G. Roof Slope: 1 inches in 12 inches.

2-02 MATERIALS - FRAMING

- A. Hot Rolled Structural Shapes; ASTM A572, 50 KSI minimum.
- B. Cold Forming: ASTM A 607, Grade 55 minimum.
- C. Pipe Columns: ASTM A501
- D. Structural Tubing: ASTM A 500, Grade B cold-formed.
- E. Plate or Bar Stock: ASTM A 572, 50 KSI minimum.
- F. Anchor Bolts: ASTM A 307, galvanized to ASTM A 153/A 153M.
- G. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), galvanized to ASTM A 153/A 153M.
- H. Galvanized Steel Sheet: ASTM A 446, with G90 coating, classification to suit building manufacturer's standards.

- I. Welding Materials: Type required for materials being welded.
- J. Primer: SSPC-Paint 20, Red Oxide.

2-03 MATERIALS - WALLS AND ROOF

- A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, SS Grade 33/230, with G90/Z275 coating.
- B. Insulation: Semi-rigid glass fiber type, faced with reinforced white vinyl, ASTM E84 flame spread index of 25 or less where exposed.
- C. Joint Seal Gaskets: Manufacturer's standard type.
- D. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A 153/A 153M, finish to match adjacent surfaces when exterior exposed.
- E. Bituminous Paint: Asphaltic type.
- F. Sealant: Manufacturer's standard.
- G. Trim, Closure Pieces, Caps, Flashings, Facias: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2-04 COMPONENTS

- A. Doors and Frames: Manufacturer's standard.
- B. Overhead Doors and Frames: Manufacturer's standard.
- C. Windows: Manufacturer's standard.
 - 1. Glass and Glazing: Specified in Section 08800.
- D. Wall Louvers: Z blade design, same finish as adjacent material, with steel mesh bird screen and frame, blank sheet metal at unused portions.
- E. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.
- F. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners.
- G. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material to maintain weather tight installation.
- H. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2-05 FABRICATION - FRAMING

- A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.
- B. All material shall be complete, fabricated and prepared for shipment (knocked down), including any necessary crating or bundling. All parts of building are to be accurately made and true to dimension so that in erection of same all parts will easily fit together.
- C. All structural steel members are to be sheared, formed, punched, welded and painted in the plant of the manufacturer.

- D. Welding shall be in accordance with the standard practices of the American Welding Society, and shall be performed by qualified and certified welders. Arc strikes to be ground and repaired per AWS Standards.
- E. Holes and clips required for primary and secondary connections shall be provided as required in the plant of the manufacturer.
- F. Design sizes of prefabricated components and necessary field connections required for erecting to permit easy assembly and disassembly. Fabricate components in such manner that once assembled they may be disassembled, repackaged and reassembled with a minimum amount of labor and maximum salvageability.
- G. Clearly and legibly mark each piece and part of assembly to correspond with previously prepared erection drawings, diagrams and instruction manuals.

2-06 FABRICATION - WALL AND ROOF PANELS

- A. Roof Panels: Standing Seam Roof Panels; 18 inches wide
 - 1. Side Joints: Factory applied sealant.
 - 2. Material: Galvalume steel.
 - 3. Thickness: 24 gage minimum.
 - 4. Side laps: Two factory-formed interlocking ribs, with one weather sealed joint, field-seamed into place to form a double-fold 360 degree seam.
 - 5. Length: continuous from eave to ridge up to 41 feet in length.
 - 6. Endlaps, Where Required: 7 inches wide, located at a support member.
 - 7. Panel-to-roof purlin structural attachments: Clips with movable tabs which interlock with seamed panel ribs and provide for 1 inch of panel movement in either direction from center of clip to compensate for thermal effects.
- B. Wall Panels: Vee Rib; 36 inch wide net coverage, with reverse ribs 12 inches on center 1-1/4 inches deep, sculptured profile with textured finish.
 - 1. Material: Galvanized steel, with G90/Z275 coating.
 - 2. Thickness: 24 gage minimum.
 - 3. Side laps: Two Factory formed interlocking ribs, with one weather sealed joint, field seamed into place to form a double fold 360 degree seam.
 - 4. Length: continuous from eave to ridge up to 41 feet in length.
 - 5. Endlaps, Where Required: 7 inches wide, located at a support member.
 - 6. Panel-to-roof purlin structural attachments: Clips with movable tabs which interlock with seamed panel ribs and provide for 1 inch of panel movement in either direction from center of clip to compensate for thermal effects.
- C. Liner Panels: Panel Rib Liner Panels; 36 inch wide net coverage with 1-3/16 inch high major ribs with minor ribs spaces between the major ribs.
 - 1. Material: Galvanized steel with G90 coating.
 - 2. Thickness: 0.0184" design base metal.
 - 3. Provide liner panel wainscot, as indicated on drawings.

D. Panel Fasteners:

- 1. For finished roof panels: Stainless steel-capped carbon steel fasteners with integral sealing washer.
- 2. For SP finished roof panels: Coated carbon steel.

- 3. For wall panels: Coated carbon steel with integral sealing washer.
- 4. Color of exposed fastener heads to match the wall panel finish.
- 5. Concealed Fasteners: Self-drilling type, of size as required.
- 6. Provide fasteners in quantities and location as required by the manufacturer.
- E. Flashing and Trim: Match material, finish and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.
- F. Plastic Parts: Glass fiber reinforced resin or thermoformed ABS (Acrylonitrile-Butadiene-Styrene).
 - 1. ABS: Minimum 1/8 inch thick.
 - 2. Color: Manufacturer's standard color.
- G. Sealants, Mastics and Closures: Manufacturer's standard type.
 - 1. Provide at roof panel endlaps, sidelaps, rake, eave, transitions and accessories as required to provide a weather resistant roof system; use tape mastic or gunnable sealant at sidelaps and endlaps.
 - 2. Provide at wall panel rakes, eaves, transitions and accessories.
 - 3. Closures: Formed to match panel profiles; closed cell elastic material, manufacturer's standard color.
 - 4. Tape Mastic: Pre-formed butyl rubber-based, non-hardening, non-corrosive to metal; white or light gray.
 - 5. Gunnable Sealant: Non-skinning synthetic elastomer based material; gray or bronze.
- H. Blanket Insulation: Glass fiber, with factory laminated facing material.
 - 1. Glass Fiber: Odorless, neutral colored, long filament, flexible resilient, 0.8 pcf density material.
 - 2. Conductivity (k): 0.29 at 40E F mean temperature and 0.31 at 70E F mean temperature.
 - 3. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
 - 4. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E 84.
 - 5. UL Classified.
 - 6. Facing: White vinyl; embossed, 0.0032 inch thick; permeance 1.00 perm.
 - 7. Provide facing 3 inches wider on both edges than blanket.
 - 8. Blanket tabs shall be attached to each other by pull through and staple methods.
 - 9. Width: As required for installation.
 - 10. Use blanket insulation at roof.
 - 11. R-Value: R-13 walls, R-19 roof.
- I. Thermal Blocks: a. High density, 3/4 inch thick extruded polystyrene, for installation over the purlin.

2-07 ROOF ACCESSORIES

A. Eave Gutters: Roll-formed 26 gage steel sheet, with gutter straps, fasteners and joint sealant; manufacturer's standard bronze color. Gutters: SMACNA Architectural Sheet metal manual, Rectangular profile.

- 1. Downspouts: With downspout elbows and downspout straps; same color as wall panels. Profile as indicated.
- 2. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA Architectural Sheet Metal Manual.
- 3. Splash Pads: Precast concrete type, of size and profiles indicate; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
- 4. Seal metal joints.
- B. Roof Curbs: Welded units fabricated for shingled installation with roof panels; minimum 18 gage Galvalume coated steel, with welds cleaned and treated with protective coating compatible with the Galvalume substrate.
 - 1. Top of curbs horizontal with 1-1/2 inch perimeter flange.
 - 2. Curb walls insulated with 1-1/2 inches, 3 pcf density rigid glass fiber insulation.
 - 3. Water Diversion: Integral 4 inch high by full length cricket on upslope side.
 - 4. Exposed curb flanges pre-drilled for correct fastener locations.
 - 5. Upslope and downslope curb flanges with integral welded inside and outside cell closers compatible with the roof panel profile.
 - 6. Curb Framing: Mounted on secondary structural members and installed from the top; compatible with the thermal expansion and contraction properties of the roof on which it is used.
 - 7. Opening Size: As indicated on drawings.
 - 8. Curbs for Roof Panels: One-piece type.

2-08 FABRICATION - GUTTERS AND DOWNSPOUTS

- A. Fabricate of same material and finish as roofing metal.
- B. Form gutters and downspouts and scuppers of profile and size indicated to collect and remove water. Fabricate with connection pieces.
- C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.
- D. Fabricate support straps of same material and finish as roofing metal, color as selected.

2.09 FINISHES

- A. Framing Members: Clean, prepare, and prime to SSPC Manual requirements. Do not prime surfaces to be field welded.
- B. Roof and wall panels, gutters and downspouts, and related trim as follows:
 - 1. Kynar 500 Fluorocarbon coating applied on the top side of the panel with a thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil.
 - 2. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall confirm to all tests for adhesion, flexibility and longevity as specified by Kynar 500 finish supplier.
- C. Interior Surfaces of Wall Components and Accessories: Precoated enamel on steel of fluoropolymer finish, color as selected from manufacturer's standard range.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3-02 ERECTION - FRAMING

- A. Erect framing in accordance with AISC Specification for Structural Steel Buildings.
- B. Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts.
- C. Purlins and/or Bar Joists: Provide rake or gable purlins/joists with tight fitting closure channels and fascias. Secure to structural framing and hold rigidly to a straight line by sag angles.
- D. Field modifications of parts shall be in accordance with the best standard procedures and shall be the responsibility of the building erector. All field modifications shall be approved in advance by the Contracting Officer.
- E. Erection of the metal building, accessories, insulation and the interior finish, if applicable, shall be performed by the building erector of the manufacturer.
- F. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.
- G. Set column base plates with non-shrink grout to achieve full plate bearing.
- H. After erection, prime welds, abrasions, and surfaces not shop primed.

3-03 ERECTION - WALL AND ROOF PANELS

- A. Install in accordance with manufacturer's instructions.
- B. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage.
- C. Provide weather seal under ridge cap; flash and seal roof panels at eave and rake with rubber, neoprene or other closures to exclude weather.
- D. Provide sealant tape at lapped joints of ribbed roof sheets, and between roof sheeting and protruding equipment, vents and accessories.
- E. Apply sealant tape continuous to clean, dry surface of weather side of fastenings on end laps and elsewhere to make weatherproof to driving rains.
- F. Apply elastomeric sealant continuous between metal base channel (sill angle) and concrete and elsewhere for waterproofing. Handle and apply sealant and backup in accordance with sealant manufacturer's recommendations.

- G. Roof panels shall be fastened to the purlins/joists with manufacturer's standard concealed fasteners adequately spaced to develop the uplift requirements, attached at each support with self-drilling fasteners.
- H. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- I. Fasten cladding system to structural supports, aligned level and plumb.
- J. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.
- K. Align bottoms of wall panels and fasten panels with blind rivets, bolts or self-tapping screws. Fasten flashings, trim around openings, etc., with self-tapping screws.
- L. Install insulation and vapor retarder. Place wire mesh under vapor retarder for support between framing members.
- M. Install sealant and gaskets to prevent weather penetration.

3-04 ERECTION - GUTTERS AND DOWNSPOUTS

- A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
- B. Apply bituminous paint on surfaces in contact with cementitious materials.
- C. Slope gutters minimum 1/4 inch/ft.
- D. Install splash pans under each downspout.

3-05 INSTALLATION - ACCESSORIES

- A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.
- B. Anchor Bolts: The Contractor shall be responsible for coordinating anchor bolt placement as detailed in approved erection drawings. All columns shall have a minimum of four (4) anchor bolts each unless noted otherwise.
- C. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.
- D. Sheet Metal Accessories: Install gutter, downspouts, curbs and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting.
- E. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 07900.

3-06 TOLERANCES

- A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.
- B. Siding and Roofing: 1/8 inch from true position.

DIVISION 13- SPECIAL CONSTRUCTION

SECTION 13310

ELECTRICAL, INSTRUMENTTATION, AND CONTOLS

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SECTION 13310 ELECTRICAL, INSTRUMENTATION, AND CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

The work covered under this section of the specifications includes the furnishing and installing of all instrumentation and control equipment, hereinafter specified to perform the intended function of monitoring and control within the wastewater treatment facility.

1.02 SINGLE SOURCE SYSTEM SUPPLIER

- A. The Power Control Center (PCC), Motor Control Centers (MCCA and MCCB), and all instrumentation and control systems equipment shall be furnished by a single source System Supplier. The System Supplier shall provide all equipment listed above, instruct the Contractor on proper installation, and be responsible for proper operation of the complete instrumentation and control system. Control panels furnished as a part of equipment packages shall be properly integrated into the instrumentation and control system by the System Supplier. All submittal drawings and fabrication drawings shall be generated and prepared by the System Supplier. All assembly of equipment shall be performed by the System Supplier. The entire system shall be factory tested by the System Supplier prior to shipment.
- B. The Power Control Center (PCC) shall be Control Systems, Inc. Model No. PC30004-480-SBS, or equal with loads as detailed on the Drawings (reference Specification Sections 16480, 16481, and 16482) and as approved by the Contracting Officer. Substitutions for equipment specified will not be acceptable unless identical function is provided, and reliability, flexibility and repair/replacement costs are similar. If alternate equipment is supplied, the Contractor shall provide a replacement cost schedule for each component valid for a minimum of twelve months after final acceptance of the project.
- C. The Contractor shall assign full responsibility for the function and operation of all plant instrumentation and control systems to a Single Source System Supplier. This System Supplier shall be responsible for all coordination necessary in order to select, to furnish, to supervise installation and connections, to calibrate, and to place into operation all instrumentation and controls along with all other equipment and accessories as specified herein.
- D. The System Supplier shall be one of established favorable reputation who has designed and produced similar systems and components for a period of at least ten years. The System Supplier shall maintain a full time service organization within 200 miles of the project site.

The Contractor shall be responsible for the costs of design changes, including engineering, electrical, structural, etc., incurred as a result of the use of alternate equipment.

1.03 SUBMITTAL DRAWINGS

- A. Descriptive literature and drawings for equipment and systems being furnished under this section shall be included in two submittals. If two submittals are made, the first shall include all primary devices, transmitters, sensors, and field mounted equipment. The second submittal will include the balance of the submittal required. The submittal shall include as a minimum, equipment specifications, dimensional drawings, flow and other calculations, schematic drawings of each and every system within the complete offering, and such other information requested by the Contracting Officer or considered necessary to the proper installation of the equipment. Furnish submittals in a Bound Booklet. This submittal shall include coordinated information and drawings for all items that the Single Source System Supplier is required to furnish and coordinate with under this Section of the Specifications, all in one integrated and coordinated manual. Each item of a submittal shall carry the appropriate title and be indexed against the appropriate specification item.
- B. A quantity of five (5) sets of submittals shall be furnished for the Contracting Officer's approval.

1.04 INSTRUCTION MANUALS

A. Prior to 65% of the value of job completion, System Supplier shall furnish three (3) copies to the Contracting Officer of all descriptive matter and complete system operation instruction manuals in separate indexed binders coordinated with the equipment that is furnished and installed for approval. System Supplier shall incorporate Contracting Officer's comments and resubmit for approval within 30 days of receipt of Contracting Officer's comments. Once final approval is obtained, System Supplier shall furnish four (4) copies to the Contracting Officer.

PART 2 COMPUTER CONTROL AND DATA ACQUISITION SYSTEM

2.01 GENERAL SPECIFICATIONS

A. SYSTEM DESCRIPTION

- 1. The following specification describes the requirements for in-plant computer control and data acquisition telemetry system for use in the wastewater treatment facility and for communication with a proposed wastewater collection system.
- 2. A fully integrated control and data acquisition telemetry system will be designed, furnished, and installed which provides the owner supervisory control and data acquisition using dedicated communications cables. The system shall further be capable of accepting input from remote sites utilizing radio communications, dedicated communications cables, or telephone dial-up.
- 3. The following significant items are to be furnished and installed complete in every detail:
 - a. Two System Computers, Intelligent Controllers (as described herein), interconnect cabling and conduit, printers, telephone modem, and HMI

- (Human Machine Interface).
- b. Interface sensors and relays not furnished by owner and as specified.
- 4. The system shall have the capability of performing the following functions:
 - a. Supervisory control and monitoring of control system parameters.
 - b. Supervisory control and monitoring of system equipment (treatment facility equipment).
 - c. Monitor pressure, differential pressure, temperature, and peripheral sensors both, analog or digital.
 - d. Process digital values, on/off, high/low, modulating.
 - e. Process analog values with set points.
 - f. Process metering, flow rate and total flows.
 - g. Provide an operator interface with system.
 - h. Provide records of appropriate system transactions.
 - i. Provide local control functions as specified at each location.
 - j. Provide motor accumulated run time totals for each motor.
- 5. The telemetry strategy used shall be based upon an industry standard protocol. Standard MODBUS is the preferred protocol, although other nonproprietary protocols may be submitted. All protocols other than MODBUS must be submitted with complete documentation. Documentation the Contracting Officer deems insufficient shall disqualify the protocol. The Contracting Officer reserves the right to disqualify the Contractor's bid based upon a disqualified protocol. No proprietary communications protocol shall be accepted.

B. QUALITY ASSURANCE

- 1. The supplier of the control system must be able to demonstrate to the satisfaction of the Owner that similar existing systems designed, furnished, and installed by the system supplier meet the functionality, technical correctness, durability, flexibility, and aesthetic expectations of the Owner.
- 2. Interface protection schemes will be an integral part of the system including, but not limited to the following measures:
 - a. All hardwired interconnected panels and devices within a facility will be grounded with a minimum of one #6 bare copper conductor attached with copper, bronze, or stainless steel high quality connectors.
 - b. All Intelligent Controllers will be equipped with suitable MOVs, dry

contacts and/or opto-isolation devices for surge protection.

C. TRAINING

A minimum of twenty-four hours of on-site training will be provided on the system operations and maintenance. Training will be conducted at the Owner's treatment facility on the equipment to be furnished and installed as a part of this Project. The twenty-four hours of training will be conducted in four (4), six (6) hour days.

D. SYSTEM SUPPORT

- 1. Unlimited telephone support will be provided for a period of one year.
- 2. Replacement parts will be shipped within 24 hours of request.
- 3. A telephone modem and modem software will be an integral part of the computer system supplied to enhance software support.

E. MAINTENANCE

- 1. The system supplier will maintain on call qualified field service electricians and electronic technicians to assist in normal system troubleshooting.
- 2. In the event emergency repairs are required, the system supplier shall respond within a maximum of 24 hours.

F. WARRANTY

The system supplier shall provide a written warranty with the approval drawings covering all materials and parts furnished for a period ending one year after final acceptance of the project. This warranty shall cover all material replacement, all labor, and all travel expenses. The system supplier manufacturer shall maintain a full time service organization within a 250-mile radius of the project site. This warranty shall not cover damage to the system due to vandalism, misuse, the environment, or acts of others.

I. SUBMITTALS

All approval drawings shall be prepared per J.I.C. standards for the Contracting Officer's review prior to any fabrication of control equipment. The control system shall be produced by a UL 508 listed shop. Proof of label availability shall be submitted with the approval drawings.

The vendor shall provide the following submittal information to the Owner:

- 1. Overview drawing.
- 2. System diagram.
- 3. Significant item cut sheets.
- 4. Interconnect diagrams.

- 5.
- Spare parts list. Installation, operations, and maintenance manuals. 6.
- Warranty document.
 Schedule of events. 7.
- 8.

2.02 I/O POINT LIST

Point ID	Dig/Analog/Serial	Description
Influent Pump S		1
PLC2-1	AI	IPS – Level
PLC2-2	DI	IPS – Pump No. 1 Status "Running"
PLC2-3	DI	IPS – Pump No. 1 Status "Failed"
PLC2-4	DO	IPS – Pump No. 1 On/Off
PLC2-5	DI	IPS – Pump No. 2 Status "Running"
PLC2-6	DI	IPS - Pump No. 1 Status "Failed"
PLC2-7	DO	IPS – Pump No. 2 On/Off
PLC2-8	DI	IPS – Pump No. 3 Status "Running"
PLC2-9	DI	IPS – Pump No. 3 Status "Failed"
PLC2-10	DO	IPS – Pump No. 3 On/Off
PLC2-11	AO	IPS – Pump No. 3 Speed Reference
PLC2-12	DI	IPS – Pump No. 4 Status "Running"
PLC2-13	DI	IPS – Pump No. 4 Status "Failed"
PLC2-14	DO	IPS – Pump No. 4 On/Off
PLC2-15	AO	IPS - Pump No. 4 Speed Reference
PLC2-16	DI	IPS – High Level Alarm
PLC2-17	DI	Spare
PLC2-18	DI	IPS – Lag Large Pump Start
PLC2-19	DI	IPS – Lead Large Pump Start
PLC2-20	DI	IPS – Lag Small Pump Start
PLC2-21	DI	IPS – Lead Small Pump Start
PLC2-22	DI	IPS – Pump(s) Stop
PLC2-23	DI	IPS – Low Level Alarm
PLC2-24	DI	IPS – Small Pump P1 Lead
PLC2-25	DI	IPS – Small Pump P2 Lead
PLC2-26	DI	IPS – Large Pump P3 Lead
PLC2-27	DI	IPS – Large Pump P4 Lead
PLC2-28	DI	IPS - Pump No. 1 HOA Selector Switch in "Auto"
PLC2-29	DI	IPS - Pump No. 2 HOA Selector Switch in "Auto"
PLC2-30	DI	IPS - Pump No. 3 HOA Selector Switch in "Auto"
PLC2-31	DI	IPS – Pump No. 4 HOA Selector Switch in "Auto"
PLC2-32	DI	Spare
PLC2-33	DI	Spare
Influent Flow		T
PLC2-34	AI	Influent Flow
Grit System		
PLC2-35	DI	Grit System – Status "Running"
PLC2-36	DI	Grit System Common Alarm
PLC2-37	DI	Grit Pump– Status "Running"
PLC2-38	DI	Grit Pump– Conveyor "Running"
Bar Screen		
PLC2-39	DI	Bar Screen – Status "running"
PLC2-40	DI	Bar Screen System Common Alarm
Digesters		
PLC3-1	DI	Digester Blower No. 1 – Status "Running"
PLC3-2	DI	Digester Blower No. 1 – Status " Failure"

DI C2 2	DI	D' (DI) 1 2 C(((D) ; 2)
PLC3-3	DI	Digester Blower No. 2 – Status "Running"
PLC3-4	DI	Digester Blower No. 2 – Status "Failure"
PLC3-5	DI	Digester Blower No. 3 – Status "Running"
PLC3-6	DI	Digester Blower No. 3 – Status "Failure"
PLC3-7	DI	Digester Blower No. 4 – Status "Running"
PLC3-8	DI	Digester Blower No. 4 – Status "Failure"
PLC3-9	DI	Digester Thickener – Status "Running"
PLC3-10	DI	Digester Thickener – Status "Failure"
PLC3-11	DI	Waste Pump No. 1 – Status "Running"
PLC3-12	DI	Waste Pump No. 1 – Status "Failure"
PLC3-13	DI	Waste Pump No. 2 – Status "Running"
PLC3-14	DI	Waste Pump No. 2 – Status "Failure"
PLC3-15	DI	Waste Pump No. 3 – Status "Running"
PLC3-16	DI	Waste Pump No. 3 – Status "Failure"
PLC3-17	DI	Waste Pump No. 4 – Status "Running"
PLC3-18	DI	Waste Pump No. 4 – Status "Failure"
U.V. System		
PLC2-59	DI	UV System – Common Alarm
PLC2-60	S	UV System Intensity from Digital RS485
PLC2-61	AI	UV System Intensity UV System Intensity
Effluent Flow	All	O v System mensity
PLC2-62	AI	Effluent Flow
Effluent Pump		Efficial Flow
		EDC Dumm No. 1 Status "Dumming"
PLC4-1	DI	EPS – Pump No. 1 Status "Running"
PLC4-2	DI	EPS – Pump No. 1 Status "Failed"
PLC4-3	DI	EPS – Pump No. 1 Status "Seal Failure"
PLC4-4	DO	EPS – Pump No. 1 On/Off
PLC4-5	DI	EPS – Pump No. 2 Status "Running"
PLC4-6	DI	EPS – Pump No. 2 Status "Failed"
PLC4-7	DI	EPS – Pump No. 2 Status "Seal Failure"
PLC4-8	DO	EPS – Pump No. 2 On/Off
PLC4-9	DI	EPS – Pump No. 3 Status "Running"
PLC4-10	DI	EPS – Pump No. 3 Status "Failed"
PLC4-11	DI	EPS – Pump No. 3 Status "Seal Failure"
PLC4-12	DO	EPS – Pump No. 3 On/Off
PLC4-13	DI	EPS – High Water Alarm
PLC4-14	DI	EPS – Pump No. 1 HOA Selector Switch in "Auto"
PLC4-15	DI	EPS – Pump No. 2 HOA Selector Switch in "Auto"
PLC4-16	DI	EPS – Pump No. 3 HOA Selector Switch in "Auto"
Aeration Basin	(AB)	
PLC1-1	DI	AB No. 1 – Motor 1 – Status "Running"
PLC1-2	DI	AB No. 1 – Motor 1 – Status "Failed"
PLC1-3	DO	AB No. 1 – Motor 1 – On/Off
PLC1-4	DI	AB No. 1 – Motor 2 – Status "Running"
PLC1-5	DI	AB No. 1 – Motor 2 – Status "Failed"
PLC1-6	DO	AB No. 1 – Motor 2 – On/Off
PLC1-7	DI	AB No. 1 – Motor 3 – Status "Running"
PLC1-8	DI	AB No. 1 – Motor 3 – Status "Rulling" AB No. 1 – Motor 3 – Status "Failed"
PLC1-9	DO	AB No. 1 – Motor 3 – Status Paned AB No. 1 – Motor 3 – On/Off
		AB No. 1 – Motor 4 – Status "Running"
PLC1-10	DI	
PLC1-11	DI	AB No. 1 – Motor 4 – Status "Failed"
PLC1-12	DO	AB No. 1 – Motor 4 – On/Off
PLC1-13	DI	AB No. 1 – Motor 5 – Status "Running"
PLC1-14	DI	AB No. 1 – Motor 5 – Status "Failed"
PLC1-15	DO	AB No. 1 – Motor 5 – On/Off
PLC1-16	DI	AB No. 1 – Motor 6 – Status "Running"

		T
PLC1-17	DI	AB No. 1 – Motor 6 – Status "Failed"
PLC1-18	DO	AB No. 1 – Motor 6 – On/Off
PLC1-19	DI	AB No. 1 – Motor 7 – Status "Running"
PLC1-20	DI	AB No. 1 – Motor 7 – Status "Failed"
PLC1-21	DO	AB No. 1 – Motor 7 – On/Off
PLC1-22	DI	AB No. 1 – Motor 8 – Status "Running"
PLC1-23	DI	AB No. 1 – Motor 8 – Status "Failed"
PLC1-24	DO	AB No. 1 – Motor 8 – On/Off
PLC1-25	DI	AB No. 1 – Motor 9 – Status "Running"
PLC1-26	DI	AB No. 1 – Motor 9 – Status "Failed"
PLC1-27	DO	AB No. 1 – Motor 9 – On/Off
PLC1-28	DI	AB No. 1 – Motor 10 – Status "Running"
PLC1-29	DI	AB No. 1 – Motor 10 – Status "Failed"
PLC1-30	DO	AB No. 1 – Motor 10 – On/Off
PLC1-31	DI	AB - Motor 1 HOA Selector Switch in "Auto"
PLC1-32	DI	AB - Motor 2 HOA Selector Switch in "Auto"
PLC1-33	DI	AB - Motor 3 HOA Selector Switch in "Auto"
PLC1-34	DI	AB - Motor 4 HOA Selector Switch in "Auto"
PLC1-35	DI	AB - Motor 5 HOA Selector Switch in "Auto"
PLC1-36	DI	AB - Motor 6 HOA Selector Switch in "Auto"
PLC1-37	DI	AB - Motor 7 HOA Selector Switch in "Auto"
PLC1-38	DI	AB - Motor 8 HOA Selector Switch in "Auto"
PLC1-39	DI	AB - Motor 9 HOA Selector Switch in "Auto"
PLC1-40	DI	AB - Motor 10 HOA Selector Switch in "Auto"
Clarifier	Di	AD Motor to Horr Selector Switch in Auto
PLC1-41	DI	Clarifier No. 1 Drive – Status "Running"
PLC1-42	DI	Clarifier No. 1 Drive – Status "Failed"
PLC1-43	DI	Clarifier No. 1 Drive – High Torque Warning
PLC1-44	DI	Clarifier No. 1 Drive – High Torque Alarm
PLC1-45	DO	Clarifier No. 1 Drive – On/Off Control
PLC1-46	DI	Clarifier No. 2 Drive – Status "Running"
PLC1-47	DI	Clarifier No. 2 Drive – Status "Failed"
PLC1-48	DI	Clarifier No. 2 Drive – High Torque Warning
PLC1-49	DI	Clarifier No. 2 Drive – High Torque Alarm
PLC1-50	DO	Clarifier No. 2 Drive – On/Off Control
RAS Pump Stat		Charmer 140. 2 Bitve Oh On Condor
PLC1-51	DI	RAS Pump No. 1 – Status "Running"
PLC1-52	DI	RAS Pump No. 1 – Status "Failure"
PLC1-53	DI	RAS Pump No. 1 – Status "Lube Failure"
PLC1-54	DO	RAS Pump No. 1 – On/Off Control
PLC1-55	DI	RAS Pump No. 2 – Status "Running"
PLC1-56	DI	RAS Pump No. 2 – Status Kuming RAS Pump No. 2 – Status "Failure"
PLC1-57	DI	RAS Pump No. 2 – Status "Failure"
PLC1-58	DO	RAS Pump No. 2 – On/Off Control
PLC1-59	DI	RAS Pump No. 3 – Status "Running"
PLC1-60	DI	RAS Pump No. 3 – Status "Failure"
PLC1-61	DI	RAS Pump No. 3 – Status "Lube Failure"
PLC1-62	DO	RAS Pump No. 3 – Status Luce Pantite RAS Pump No. 3 – On/Off Control
PLC1-63	DI	RAS Pump No. 1 HOA Selector Switch in "Auto"
PLC1-64	DI	RAS Pump No. 2 HOA Selector Switch in "Auto"
PLC1-65	DI	RAS Pump No. 3 HOA Selector Switch in "Auto"
RAS Flow	DI	1 1010 1 dilip 110. 5 110/A Selector Switch iii Addo
PLC1-66	AI	RAS Flow
WAS Flow	-AI	1010 1 10W
PLC1-67	AI	WAS Flow
1 LC1-0/	/AI	WADIIUW

WAS Flow Valve			
PLC1-68	AI	WAS Valve – Status	
PLC1-69	AO	WAS Valve – Set Point	
Waste Sludge			
PLC1-70	AI	Waste Sludge Flow	
Decant Pumpsta	ation		
PLC2-79	DI	EPS – Pump No. 1 Status "Running"	
PLC2-80	DI	EPS – Pump No. 1 Status "Failed"	
PLC2-81	DI	EPS – Pump No. 1 Status "Seal Failure"	
PLC2-82	DO	Spare	
PLC2-83	DI	EPS – Pump No. 2 Status "Running"	
PLC2-84	DI	EPS – Pump No. 2 Status "Failed"	
PLC2-85	DI	EPS – Pump No. 2 Status "Seal Failure"	
PLC2-86	DO	Spare	
PLC2-87	DI	EPS – High Water Alarm	
PLC2-88	DI	EPS – Pump No. 1 HOA Selector Switch in "Auto"	
PLC2-89	DI	EPS – Pump No. 2 HOA Selector Switch in "Auto"	
Scum Pumpstati	ion		
PLC2-90	DI	EPS – Pump No. 1 Status "Running"	
PLC2-91	DI	EPS – Pump No. 1 Status "Failed"	
PLC2-92	DI	EPS – Pump No. 1 Status "Seal Failure"	
PLC2-93	DO	Spare	
PLC2-94	DI	EPS – Pump No. 2 Status "Running"	
PLC2-95	DI	EPS – Pump No. 2 Status "Failed"	
PLC2-96	DI	EPS – Pump No. 2 Status "Seal Failure"	
PLC2-97	DO	Spare	
PLC2-98	DI	EPS – High Water Alarm	
PLC2-99	DI	EPS – Pump No. 1 HOA Selector Switch in "Auto"	
PLC2-100	DI	EPS – Pump No. 2 HOA Selector Switch in "Auto"	

An additional 25% spare digital I/O points and an additional 25% spare analog I/O points shall be made available in each PLC to be provided.

2.03 EQUIPMENT SPECIFICATION

A. INTELLIGENT CONTROLLER(S) COMPONENT SPECIFICATION

1. **GENERAL**

- a. Provide a microprocessor based programmable logic controller that can be used in a stand-alone configuration and can networked into a larger system. It shall be suitable for telemetry applications performing as an intelligent controller. The unit shall be fully programmable and capable of performing control relay logic, including timing, counting, sequencing, and interlocking.
- 2. The intelligent controller shall have a modular chassis design, which allows for ease of future expansion. The processor module shall be easily removed from the I/O chassis for service or repair. The I/O chassis shall have slots for installing I/O cards, communications, or other special function modules. All I/O cards and modules, with the exception of the CPU, shall be capable of being installed in any open slot in the chassis.

- 3. The intelligent controller shall have a modular power supply which mounts directly to the I/O chassis and can be easily serviced or replaced. The system shall be capable of being powered on 120VAC or 24VDC, by simply choosing different power supply modules.
- 4. The processor shall have solid-state RAM memory to store the application program, process data, and alarm status. This memory shall have both capacitor and battery backup in the event that input power to the processor is lost. It shall also have the capability of EEPROM backup which automatically reloads the memory on a power cycle. The processor shall have the ability to automatically go into the RUN mode on a power cycle, provided there are no major or unrecoverable processor faults.
- 5. The intelligent controller shall be rated to operate from 0 to 60 Degrees C, with a humidity rating of 5 to 95% (non-condensing). The intelligent controller must be UL listed and CSA certified. All module circuit boards shall be encased and protected such that, when properly installed, they are not exposed to accidental contact.
- 6. The intelligent controller shall be of high quality and reliability with replacement processors, power supplies, chassis, I/O and specialty modules that are readily available on an urgent or emergency basis. All intelligent controller products shall be fully supported and available for purchase for up to seven (7) years from the date of the original system purchase.
- 7. Product maintenance training shall be available from factory trained support representatives.

B. PROCESSOR

- 1. Processor RAM shall be a minimum of 12K words for program storage.
- 2. Processor Scan Time shall not exceed 1 msec per 1K program typical.
- 3. Basic Processor Functions
 - a. Real-time control of output points for turning on and off digital devices such as motor starters and solenoids.
 - b. Read the status of real world digital inputs from limit switches, float switches, and other field devices.
 - c. Real-time control of analog process control variables.
 - d. Read the status of real world analog set points and feedback values.
 - e. Perform timing, counting, sequencing, and interlocking functions for pump control.
 - f. Process local alarm handling functions
- 4. Math and Advanced Functions:

- a. Four function math in floating point or signed integer format
- b. Convert to/from BCD
- c. Data comparison and manipulation
- d. Scaling from integer data into Contracting Officer units such as flow and pressure
- e. Full PID Instructions for control of process control variables such as flow and pressure.
- f. ASCII instruction set for interfacing to ASCII devices
- g. Built-in processor interrupts functionality to report recoverable processor faults back to the polling master
- 5. Real-Time Calendar Clock for time stamping alarms and events. Clock must be accurate to within plus or minus 60 seconds per month while operating at 25 deg. C.
- 6. Built-in RS-232 port for serial communications
- 7. Removable processor key switch to guard against program tampering by unauthorized personnel.

C. I/O CHASSIS

- 1. Slotted I/O chassis must be available in 4, 7, 10, and 13 Slot configurations.
- 2. The chassis shall be sized such that there is room to add additional modules for future process expansion. At least one open slot shall be available on 4 and 7 slot chassis, and a minimum of two open slots shall be available on the 10 and 13 slot chassis.
- 3. The system must have the ability to add expansion chassis(s) to the main chassis without the use of a remote I/O adapter module. Passive extension or ribbon cables are acceptable for the extension chassis(s). Product shall be of hook and hang design and suitable for mounting on an enclosure sub-panel.

D. I/O CARDS

- 1. Discrete Input Cards: Solid-state input circuits rated for 10-30VDC operation. Cards must be available in 8- and 16-point configurations and shall source current to the field device. Each input point shall have a status LED which indicates the ON or CLOSED condition for that field sensor or switch. Cards with 16 points must have removable terminal strips so that module can be easily replaced without disturbing the field wiring.
- 2. Discrete Output Cards: Relay-contact output circuits rated for 5-265VAC or 5-125VDC operation. Cards must be available in 4-, 8-, and 16-point configurations.
- 3. Analog Input Cards: Analog inputs shall capable of reading in -20 to +20mA, 0 to +20mA, or 4 to 20mA. The A/D converter shall provide a minimum 4095:1

- resolution (12 bits) over the full range from module minimum to module maximum.
- 4. Analog Output Cards: Analog Outputs shall be capable of outputting -20 to + 20mA, 0 to +20mA, or 4 to 20mA signals. The A/D converter shall provide a minimum 4095:1 resolution (12 bits) over the full range from module minimum to module maximum.

E. COMMUNICATIONS

- 1. The processor shall have, resident at its RS-232 port, a Half-Duplex communications protocol that is suitable for a multi-drop single master and multiple slave communication network. The protocol shall be capable of supporting up to 255 stations including the polling master. The communications performance between the intelligent controller processor and the Polling master shall be capable of following:
- 2. Communications protocol shall provide Report By Exception (RBE) functionality. With RBE, do not transmit any message back to the master unless a new event or alarm has occurred since the last time the slave was polled. Each intelligent controller shall have the ability to initiate a command, either to the master or a peer station.
- 3. The master shall poll the slave controllers continuously, even if the master intelligent controller is in the program mode
- 4. No ladder logic programming shall be required in the Master intelligent controller to poll the slave controllers. The Master shall have a polling list stored in its data table that identifies all controllers by station number. The polling shall take place automatically once the list has been defined, even if the master is in the "PROGRAM" mode. The remotes shall be capable of messaging the master and updating the master's data table even while the master in being programmed.
- 5. Communications protocol shall include Fast CRC Bit Error Retry functionality. Should a message be rejected due to transmission bit errors, protocol shall provide an immediate retry, not waiting for the master to time-out. Set the Master time-out to be set longer than the longest message, so that a problem remote station will not choke the SCADA system.
- 6. Peer to Peer communications between intelligent controllers without intervention from, or programming at, the Polling Master.
- 7. Non-Responding Poll List. Any remote station that does not respond and timesout shall be placed in a non-responding poll list and an operator alerted. After each poll, one of the remotes in the list shall be re-polled to determine if it has re-established communications.

- 8. Intelligent controller processor shall be capable of remote on-line programming, as well as monitoring of remote data, via the telemetry system.
- 9. Communications protocol must be "open", published, and available at no cost. Protocol must be compatible with a wide variety of manufacturers.

F. DIAGNOSTICS

- 1. The processor shall have built-in diagnostics and self-test, such that each time power is cycled, the processor does a complete CPU and RAM memory test. Additionally the power-up test will momentarily light up all diagnostic LED's to be sure they are working. The processor shall be capable of reporting major and minor fault codes and processor status information back to the polling master, provided the fault is not a catastrophic hardware failure where the processor is unable to power up.
- 2. The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within the time limit set by the watchdog timer. The watchdog timer cycle shall be adjustable from 20 msec to 2.5 seconds in 10 msec increments.
- 3. The processor shall have individual LED indicators that are clearly visible and labeled for easy identification. At a minimum the following indicators must be provided:
 - a. CPU is in RUN mode
 - b. CPU is FAULTED
 - c. CPU battery is LOW
 - d. I/O points are FORCED and are not under program control
 - e. COMMUNICATION channels are active

2.04 COMPUTER SYSTEM HARDWARE AND SOFTWARE

A. Provide two (2) system computers at locations directed by the Contracting Officer.

System Computer, Peripherals, and Options.

- 1. Pentium 4 2.0GHz Computer
 - a. RAM: 512 MB.
 - b. Drives: 40 GB HD Ultra ATA
 - c. Ports: 2-Parallel, 4-Serial, 1 USB.
 - d. 40x/10x/40x Max CD-RW
 - e. Windows 2000, or NT, (Non-OEM) version 4 (or later) with Service Pack 3 operating system.
- 2. 17" LCD Flat Screen Monitor
- 3. Keyboard, 101 Key, AT compatible; two-button mouse w/software.
- 4. Telephone Modem, internal, 56K baud with remote connect software.
- 5. Alarm Printer, Dot Matrix, 132 col, 9 pin, NLQ 80 cps, Draft 163 cps
- 6. Report Printer, Laser, Hewlett Packard 6L or equal

- 7. UPS, 750 watt, 2ms transfer, 15 minutes full load.
- B. Human Machine Interface (HMI) Software The HMI software shall be UNLIMITED Tag runtime and development version software package, or equal as approved by the Contracting Officer prior to the date for receipt of Bids.

1. General Requirements

- a. The operator interface software, herein described as the HMI (Human Machine Interface), shall be an integrated package for developing and running automation applications. The HMI shall be designed for use in Microsoft Windows 95 and Microsoft Windows NT and shall use OLE, ODBC and DDE technologies for optimal performance and integration with other software systems.
- b. The HMI shall be based on Microsoft user-interface standards. The HMI shall support object linking and embedding (OLE) for true application integration. The HMI shall store it's tag database and alarm information in a database format that is ODBC compliant and all historical data shall be stored in .dbf (dBase IV) format. The HMI shall be able to act as a DDE server and client to allow for data exchange with a wide range of devices and other Microsoft Windows applications.
- c. The HMI shall provide a Project Manager for organizing and working with projects. It shall contain all editors to create a project and shall display project files as you create them. The HMI shall come with a large selection of commonly used graphic objects and symbols that can be dragged and dropped into a graphic display. The HMI shall come with a tool that enables the user to add symbols or addresses created in an Allen-Bradley PLC-5 or SLC500 program to a project.
- d. The HMI shall provide the ability to design high-level graphics for complex applications either by using it's own drawing editor or by importing graphic display files from other drawing packages such as AutoCAD⁷, CorelDRAW⁷ and PhotoshopTM. The HMI shall have the ability to animate graphic displays via control including, but not limited to position, rotation, size and visibility.

2. Project Manager

- a. The HMI shall provide a Project Manager to organize and work with the project.
- b. The Project Manager shall be divided into two windowpanes, one for the editors and one for the objects under each editor.
- c. The Project Manager shall have two modes, edit and run. The edit mode is for creating or configuring project files. The run mode is for running the project.

d. The Project Manager shall allow the user to run the HMI system in runmode while editing project components.

3. Communications

- a. The HMI shall have two methods for collecting data from programmable controllers. One method shall rely on DDE servers and the other shall use a direct driver interface through device tags.
- b. The HMI shall have the ability to switch to a pre-defined secondary network if the primary network fails at runtime. This task shall be able to be performed either manually or automatically.
- c. The HMI shall have the ability to assign any device tag a scan class defining the Tags foreground and background scanning period.

4. Tag Database

- a. The tag database shall define what data is to be monitored. Each entry in the tag database shall be called a tag.
- b. The HMI shall have the ability for the current value of a tag to be updated from the device it is connect to and stored in RAM so it is immediately accessible to all parts of the HMI.
- c. The HMI tag database shall provide four types of tags: analog, digital, string and system. Each tag shall have the ability to receive its data via a device, from a DDE server or from memory. A tag with a device as its data source shall be linked directly to a programmable controller. A tag with DDE as its data source shall receive its data through any DDE server or from another computer using NetDDE. A tag with memory as its data source shall receive its data from a value table and can be used for local storage purposes.
- d. The tag database shall provide the ability to generate tag names up to 40 characters long. The tag names shall be able to contain the following characteristics: A to Z, 0 9, underscore () and dash (-).
- e. The tag database shall provide the ability to enter a description of the tag, describe its minimum, maximum, scale, offset and units (if analog), its on and off labels (if digital), its initial value, a security access code, have the tag logged and describe it's alarming.
- f. The tag database shall provide the ability to duplicate, edit and delete any tag.
- g. The tag database shall have the ability to selectively import tags from an Allen-Bradley PLC database. Tags imported in this way shall be copied

into the database and shall not be shared with the source PLC database.

5. Tag Monitor

The HMI shall have the ability to create and save a list of tags and monitor their values while the project is running.

6. Derived Tags

- a. The HMI shall have the ability to create a tag whose value is the result of an expression. The expression can be made up of mathematical operations, tag values, if-then-else logic and other special functions. The current value of the derived tag shall be stored in an analog, digital or string tag in a value table. Multiple derived tags may reside in the same derived tag file or in up to 20 different derived tag files that run simultaneously.
- b. The HMI shall have the ability to specify the evaluation period of the derived tag.
- c. The HMI shall have the ability to edit derived tags during development or runtime.
- e. The HMI shall have the ability to start and stop derived tag processing while the project is running.

7. Alarming

- a. The HMI shall allow the user to setup a complete alarm system.
- b. The alarm system shall have the ability to monitor any analog or digital tag for alarms, up to a maximum of 10,000 tags.
- c. The alarm system shall have the ability to define up to eight different severity classes to visually and audibly distinguish alarms.
- d. The alarm system shall have the ability to use system default messages or create unique messages to describe an alarm, log messages to a file, a printer or to both, suppress alarms for maintenance and tuning purposes and set up global alarm monitoring.
- e. The alarms system shall provide a means of displaying up to 1000 tags that are in alarm. This alarm summary display shall be fully configurable.
- f. The alarm system shall have the ability to create alarm log files periodically, at specified times and on event. This alarm log system shall have the ability to automatically purge old files after a specified time.

g. The alarm system shall have the ability to control the computer's internal bell as well as an external bell via a PLC.

8. Data Logging

- a. The HMI shall have the ability to record specific tag values under certain conditions. These conditions shall be defined by a global model. This data that is collected shall be stored in .dbf (dBase IV) format for displaying in trends, archiving for future processing or analysis, and/or using with third-party software, such as FoxPro, Crystal Reports, and Microsoft Excel, for display or analysis.
- b. The HMI shall contain a global model where the user specifies which conditions will trigger data logging. As data is logged, it shall be saved to log files. In the global model, the user shall have the ability to specify when log files will be created and deleted.
- c. The HMI shall have the ability to edit the global model during development or runtime.
- d. The HMI shall have the ability to start and stop data logging while the project is running.

9. Activity Logging

- a. The HMI shall have the ability to record information about various types of system activity. This information that is collected shall be stored in .dbf (dBase IV) format for displaying in trends, archiving for future processing or analysis, and/or using with third-party software, such as FoxPro, Crystal Reports, and Microsoft Excel, for display or analysis.
- b. The activity logger shall have the ability to log any of the following: command and macro usage, operator comments, system messages and errors, errors from the communication network and tag read and write activity
- c. The activity logger shall allow the user to designate where to store activity log files, when to create and delete log files and what activities to log.
- d. The HMI shall have the ability to edit activity logging during development or runtime.
- e. The HMI shall have the ability to start and stop activity logging while the project is running.

10. Events

a. The HMI shall have the ability to trigger actions based on an event that has an expression applied to it. An expression is an equation containing

tag values, mathematical operations, if-then-else logic or other functions. An action shall have the ability to produce a variety of functions including, but not limited to, initiating a snapshot of tag values, displaying an error screen and changing a tag value.

- b. The HMI shall have the ability to specify the evaluation period of events.
- c. The HMI shall have the ability to edit events during development or runtime.
- d. The HMI shall have the ability to start and stop event processing while the project is running.

11. Security

- a. The HMI shall he ability to allow certain users or groups of users to access only certain parts of the system. The security shall be based on a series of codes. Each code shall allow the users, or groups of users, with security privileges for that code to access the HMI commands allowed by that code. Users shall be allowed to be assigned combinations of security codes, allowing for each user to access a different set of features.
- b. The security system shall assign each person a user account with their login name, password and any desired macros.
- c. The HMI shall have a minimum of 17 different security codes
- d. The HMI shall have the ability to have security set up by inclusion or exclusion.
- e. The HMI shall have a strict security option. When strict security is on, the system checks the security codes of commands and macros no matter where they are issued. With strict security off, the system checks the security codes of commands and macros only when they are issued from a command within the graphics.
- f. The HMI shall provide a means for operators to change their passwords during while the project is running.

12. Graphic Displays

- a. The HMI shall provide a graphics display editor for creating displays using graphic objects.
- b. The graphics display editor shall have the ability to drag and drop objects from a pre-configured graphics library, paste objects that are copied to the clipboard from another Windows application, and insert objects created by another Windows application using OLE.

- c. The graphics display editor shall have tear-away toolbars and color palettes.
- d. The graphics display editor shall have as a minimum the following drawing tools: snap, grid, rectangle, rounded rectangle, line, polyline, polygon, freehand line, ellipse, arc, wedge, and text.
- e. The graphics display editor shall have as a minimum the following editing tools: tag substitute, flip, rotate, resize, reshape, align, cut, paste, copy, duplicate, group, ungroup, bring to front, send to back, space, fill, undo, redo, line and color.
- f. The graphics display editor shall have as a minimum the following viewing tools: zoom in, zoom out, pan and view entire graphic.
- g. The graphic display editor shall have the ability to use tag placeholders to provide a way to use one graphic display to represent a number of similar operations.
- h. The graphic display editor shall provide tools for each of the following as a minimum: numeric input, numeric display, string input, string display, label, arrow, recipe, alarm summary, tag monitor, input command line, trend, ActiveX button, OLE object, and ActiveX object.
- i. The graphic display editor shall have the ability to create a screen background by converting objects to wallpaper. These wallpaper objects cannot be selected or edited.
- j. The graphic display editor shall allow the user to create libraries of graphic objects.

13. Control of Graphic Displays

- a. The graphic display editor shall have the ability to attach, as a minimum, the following control to objects: blinking colors, visibility, rotation, horizontal and vertical movement, resizing (width and height), fill and touch.
- b. The graphic display editor shall use OSPTM (Object Smart Path) to visually set the range of motion for an object.
- c. The graphic display editor shall have the ability to attach OLE verb control to an OLE object.
- d. The graphic display editor shall have the ability to attach control that links an object or display to a key or mouse button so operators can perform an action by pressing a key or mouse button.

e. The graphic display editor shall have the ability to quickly test control of displays without changing to runtime.

14. Trends

- a. The HMI shall have real-time and historical trending capabilities. It shall also have the capability to display in trend layers, both real-time and historical at the same time.
- b. The trends shall be able to plot data for as many as 16 (sixteen) tags on 1 (one) trend.
- c. The trends shall have the ability to use shading to emphasize when a particular tag crosses a reference value.
- d. The HMI shall have the ability to create a trend that is part of a graphic display or act as the entire graphic display.
- e. The trends shall have the ability to interpolate a line via, as a minimum, the following: automatic interpolation, linear line, digital line and full-width representation.
- f. The trends shall have the ability to display, as a minimum, the following plot symbols: hollow square, filled square, up hollow triangle, up filled triangle, down hollow triangle, down filled triangle, hollow diamond, filled diamond, hollow circle, filled circle, dot, cross and star.
- g. The trends shall have the ability to be shaded to compare 2 (two) or more different trends.
- h. The trends shall have a marker, so that when said marker is over a point on the trend, the pen's date, time and value at the marker's location are displayed in the legend.

15. Expressions

- a. The HMI shall have the ability to compare data to other values, combine data with other data and create cause-effect relationships with other data.
- b. Expressions shall have the ability to be built from, as a minimum, the following: tag values, constants, mathematical, relational, logical and bit wise operators, built-in functions and if-then-else logic.
- c. Expressions shall have the ability to be used, as a minimum, in any one of the following: a graphic display, a derived tag, an event, an activity log, a data log and any alarm.
- d. The expression editor shall have the ability to use efficiency tools like cut, paste and copy in producing like expressions.

- e. The expression editor shall have the ability to use, as a minimum, the following arithmetic operators: addition, subtraction, multiplication, division, modulus and exponent.
- f. The expression editor shall have the ability to use, as a minimum, the following relational operators: equal, not equal, less than, greater than, less than or equal to and greater than or equal to.
- g. The expression editor shall have the ability to use, as a minimum, the following logical operators: AND, OR and negation.
- h. The expression editor shall have the ability to use, as a minimum, the following bit wise operators: AND, inclusive OR, exclusive OR, right shift, left shift and complement.

16. Interoperability

- a. The HMI shall be based on standards that allow the HMI's data to be accessed and shared among Windows applications and be fully interoperable with those Windows applications.
- b. The HMI's graphic displays shall be containers for ActiveX controls.
- c. The HMI shall log all data in files in dBase IV format for easy retrieval in other programs such as Microsoft Excel and Microsoft Query.

17. Networks

- a. The HMI shall have the ability to, while on a network, share project components among multiple workstations during development and runtime, share data logged by one workstation and use NetDDE to share tag values among multiple workstations.
- b. The HMI shall have the ability to store the following components on a central file server: security, graphic displays, activity logs, alarm logs and data logs.

PART 3 EXECUTION

3-01 CONTROL ALGORITHM

A. To perform the control function system control shall be distributed across the control and data acquisition telemetry system. The control functions shall be provided by the new or existing local controls or be embedded in the intelligent controllers. The system control algorithm shall not reside in the System Computer to prevent a computer malfunction from disabling the entire control system. The System Computer shall provide operator supervisory control only. The System Computer shall be able to be disconnected from the telemetry system and the system must continue to operate

properly.

B. Central Computer Software Requirements for the Wastewater Treatment Computer Control and Data Acquisition Telemetry System

1. Graphical Screens

- a. System overview The system supplier shall provide a system overview graphical screen which shall indicate all system conditions on the site of the wastewater treatment facility. This screen shall allow the operator to directly access the individual location, trend, and alarm screens as well as indicate alarm conditions at each monitored item of equipment or metering device.
- b. Detailed Screens The system supplier shall provide a detailed screen(s) for each monitored item of equipment or metering device. The detailed screens shall indicate all data gathered at the location, as described above. The number of detailed screens provided shall be at the discretion of the Contracting Officer. The Contracting Officer shall approve the screens and request the system supplier add screens to prevent "clutter".
- c. General Alarm Screens The system supplier shall provide a general alarm screen to indicate system alarm conditions. This screen shall allow the operator to directly access the alarm screens for each equipment location.
- d. Location Alarm Screens The system supplier shall provide a location alarm screen to indicate system alarm conditions at each individual location. The Contracting Officer shall approve the screens and request the system supplier add screens to prevent "clutter".
- e. Trend Screens The system supplier shall provide a minimum of four trending screens. The screens shall allow the operator to select various system analog signals to be trended.
- 2. Reports The system supplier shall provide a daily, weekly and monthly reports. These reports shall include average, maximum, and minimum values for analog signals, flow total values, and run time totals for all pumps and motors. The reports shall be programmable by the Owner to change preprogrammed reports or create new reports.

PART 4 - FIELD MOUNTED INSTRUMENTS

4.01 MAGNETIC FLOWMETER

A. Magnetic flowmeter(s) and transmitter(s) supplied under this contract shall conform to the following specifications.

1. Flowmeter

- a. Operating Principle: Faraday's law of inducted voltage across any conductors moving in a magnetic field. The meter shall produce a reference voltage signal directly proportional to the rate of fluid flow.
- b. Meter Body: Flanged tubes shall be constructed of 304 stainless steel with 150 pound raised face carbon steel ANSI flanged end. Enclosure shall be rate NEMA 4X.

If required by process conditions or by notation in the instrument schedule, the meter body shall be designed to withstand accidental submergence.

- c. Liner: Liner shall be polyurethane, Teflon or Neoprene.
- d. Electrodes: Conical-Shaped 316 stainless steel ANSI type.
- e. Grounding: Protective, grounding rings of 1/8" 316 stainless steel shall be provided when non-metallic, lined or coated process piping is used.
- f. Velocity Range: 0-33 feet per second.

2. Transmitter

- a. One (1) transmitter shall be supplied for each flowmeter. Transmitter shall be of microprocessor-based design with automatic zeroing, built-in calibration, and a process noise reduction algorithm for improved performance on high solids slurry type applications. The microprocessor shall include diagnostic software that provides an external indication of a fault, and the fault location.
- b. Enclosure: Transmitter enclosure shall be splash and dust proof NEMA 4 stainless steel or cast aluminum construction.
- c. Electrical Connections: Power and signal wiring shall conform to the field wiring standards included with this specification, and shall be completely moisture and water tight.
- d. Power Requirements: 120VAC, +10%, 60Hz.
- e. Output: Transmitter shall produce two outputs, a 4-20 ma dc signal plus a pulse signal.
- f. Flow indicator: A multi-function 4 digit LCD shall provide instant monitoring of flow rate plus display calibration parameters and error messages.
- g. Sensor Cable: Sufficient length of manufacturer's special cable shall be

provided for each flowmeter. Maximum separation of 1000 feet.

3. Flowmeter/Transmitter Performance

a. Accuracy:

Pulse output

 $\pm 0.25\%$ of flow rate for line sizes from 15 to 450 mm (1/2 to 18 in) for flows from 6.0 to 100% of URL; and $\pm 0.015\%$ of URL for flows less than 6% of URL.

 $\pm 0.5\%$ of flow rate for all other line sizes for flows from 6.0 to 100% of URL; and $\pm 0.03\%$ of URL for flows less than 6% of URL.

Current Output

Same as for pulse output plus add an additional ± 0.01 mA. Digital Output

Same as for pulse output

- b. Repeatability: 0.1% of flow rate.
- c. Calibration: All flowtubes shall be wet calibrated to verify specified accuracy with traceability to the U.S. National Bureau of Standards and corresponding organizations in Canada and England.

4. Installation

- a. Location: Flowmeter(s) and transmitter(s) shall be installed in location (s) detailed on the included mechanical/piping drawings.
- b. Mounting: Transmitters shall be surface, pipe or tube mounted as required.

5. Manufacturer

Flowmeter system shall be as manufactured by the Foxboro Company, Series 8300 flowtube and IMT25 transmitter, or approved equal.

4.02 CONTROL PANELS

A. Control Panel General Construction Requirements

- 1. Enclosure shall be NEMA rated as specified on the drawings.
- 2. All power and control wires shall be stranded copper type MTW. All wiring shall

- be in covered plastic wireway.
- 3. All points necessary for external connection in the control panel whether power or control shall be wired to a terminal strip located at the top or bottom of the enclosure as directed by the engineer. The terminal strip shall be permanently marked with the same designation as the wire connected to it.
- 4. All power and control wires shall be marked at both ends using self-adhering wire markers. No two wires having different functions shall have the same designation.
- 5. All circuit breakers, motor starters, relays, timers, and other control devices mounted within the control panel shall be labeled for identification both within the panel and on the wiring schematic with corresponding designations.
- 6. Control power shall be 120 volts and shall be protected by the correctly sized circuit breaker. Additionally provide a GFI duplex receptacle mounted on the enclosure interior dead front.
- 7. Each starter shall be provided with overload protection in all three phases and each individual starter shall have phase failure protection.
- 8. Starters for motors over 50 Hp shall be reduced voltage, solid state type starters.
- 9. All motor circuit breakers selector switches, start-stop pushbuttons, and pilot lights shall be identified with an engraved Bakelite nameplate and operable from the interior dead front panel. Provide permanently affixed circuit breaker lockouts for each motor circuit breaker.
- 10. All approval drawings shall be prepared per J.I.C. standards for engineers review **prior to any fabrication** of control equipment. The Controller shall be produced by a UL 508 listed shop. Proof of label availability shall be submitted with approval drawings.
- 11. The Controller manufacturer shall provide a written warranty with approval drawings covering all Control materials and parts furnished for a period ending two years after final acceptance of the project. This warranty shall cover all material replacement, all labor, and all travel expenses.
- 12. The Controller manufacturer shall show satisfactory evidence that he maintains a fully equipped factory organization capable of furnishing adequate service for the equipment furnished, including replacement parts within a 250 mile radius of the job site. Suppliers employing outside organizations for "ON CALL" service shall not be considered.
- B. Digester Air Pump Control Panel Miscellaneous Controls
 - 1. The Digester air pump control panel shall be a NEMA 12 steel motor control center, as described in Section 16481, housed in a NEMA 3R non-walk-in stainless steel outer enclosure.

- 2. Service Entrance Equipment Provide a service entrance Delta Model LA603 lightning arrestor (LA) and Motor Saver Model 102 power monitor (PM), per component specifications. During power monitor failure all three phase motors shall not be allowed to operate.
- 3. AIR PUMP NO.1 Provide a properly sized combination shut trip circuit breaker and reduced solid state starter motor starter, complete with shorting contactor and all required timers and relays, as shown on drawings with the following additional equipment:
 - a. Provide a Control Systems, Inc. Model SC101 Simplex Controller (SC-1) or approved equal. In the automatic mode the Simplex Controller shall receive start and stop commands from the panel Intelligent Controller (PLC), also per component specifications, as described below.
 - b. Provide a Control Systems, Inc. Model MM101 Motor Monitor (MM-1) and current transformer or approved equal. The motor monitor shall provide a well positive run signal, monitor proper motor running conditions plus indicate motor running time and motor full load running amperes.
- 4. AIR PUMP NO.2 Provide the same equipment as provided for Air Pump No.1.
- 5. AIR PUMP NO.3 Provide the same equipment as provided for Air Pump No.1.
- 6. AIR PUMP NO.4 Provide the same equipment as provided for Air Pump No.1.
- 7. CONTROL POWER TRANSFORMER Provide a properly sized dry type, Transformer with 480-volt single phase primary and 120/240-volt single phase, three wire secondary with primary and secondary over current protection and circuit breakers as shown on the drawings.
- 8. INTELIGENT CONTROLLER Provide an Intelligent Controller as shown on the drawings, complete with all required power supplies and relays. The controller shall include the Digester I/O shown on the PLC point list as directed by the Contracting Officer.
- C. Effluent Pump Station Control Panel Miscellaneous Controls
 - 1. The Effluent Pump Station Control Panel shall be a NEMA 12 steel motor control center, as described in Section 16481, housed in a NEMA 3R non-walkin stainless steel outer enclosure.
 - 2. SERVICE ENTRANCE EQUIPMENT Provide a service entrance Delta Model LA603 lightning arrestor (LA) and Motor Saver Model 102 power

- monitor (PM), per component specifications. During power monitor failure all three phase motors shall not be allowed to operate.
- 3. EFFLUENT PUMP NO.1 Provide a properly sized combination shut trip circuit breaker and reduced voltage solid state motor starter, complete with shorting contactor and all required timers and relays, as shown on drawings with the following additional equipment
 - a. Provide a Control System, Inc. Model TC101 Triplex Controller (TC1-3), or approved equal, per component specifications. In the automatic mode the Triplex Controller shall receive start and stop commands from the Station Wetwell Level Controller (LMC1-3). The Level Controller shall receive an analog signal proportional to wetwell fluid depth from a Control System, Inc. Model SPLT Level Transducer (LT), or approved equal and provide the following control set points based upon rising and falling fluid level:
 - 1. High Level
 - 2. Lag 2 Pump Start
 - 3. Lag Pump Start
 - 4. Lead Pump Start
 - 5. Pump(s) stop
 - 6. Low Level Alarm
 - b. Provide a Control Systems, Inc. Model MM101 Motor Monitor (MM-1) and current transformer, or approved equal, all per component specifications. The motor monitor shall provide a well positive run signal, monitor proper motor running conditions plus indicate motor running time and motor full load running amperes.
- 4. EFFLUENT PUMP NO.2 Provide the same equipment as provided for Effluent Pump No.1
- 5. EFFLUENT PUMP NO.3 Provide space for the same equipment as provided for Effluent Pump No.1 for future Effluent Pump No. 3.
- 6. CONTROL POWER TRANSFORMER Provide a properly sized dry type, Transformer with 480-volt single phase primary and 120/240-volt single phase, three wire secondary with primary and secondary over current protection and circuit breakers as shown on the drawings
- 7. INTELIGENT CONTROLLER Provide an Intelligent Controller as shown on the drawings, complete with all required power supplies and relays. The controller shall include the EPS I/O shown on the PLC point list as directed by the Contracting Officer.
- D. Decant Pump Station Control Panel Miscellaneous Controls

- 1. SERVICE EQUIPMENT Provide a Delta Model LA603 lightning arrestor (LA) and Motor Saver Model 102 power monitor (PM), per component specifications. During power monitor failure all three phase motors shall not be allowed to operate.
- 2. DECANT PUMP NO.1 Provide a properly sized combination circuit breaker and magnetic starter motor starter, as shown on drawings with the following additional equipment:
 - a. Provide a Control Systems, Inc. Model DC101 Duplex Controller (DC1-2) and Float Module FT101, or approved equal. In the automatic mode the Duplex Controller shall receive start and stop commands from the wetwell float switches.
 - 1. High level alarm
 - 2. Lag pump start
 - 3. Lead pump start
 - 4. Pump(s) stop
 - 5. Low level alarm
 - b. Provide a Control Systems, Inc. Model MM101 Motor Monitor (MM-1) and current transformer or approved equal. The motor monitor shall provide a well positive run signal, monitor proper motor running conditions plus indicate motor running time and motor full load running amperes.
- 3. DECANT PUMP NO.2 Provide the same equipment as provided for Pump No.1.
- 4. CONTROL POWER TRANSFORMER Provide a properly sized dry type, Transformer with 480-volt single phase primary and 120/240-volt single phase, three wire secondary with primary and secondary over current protection and circuit breakers as shown on the drawings.
- E. Scum Pump Station Control Panel Miscellaneous Controls
 - 1. SERVICE ENTRANCE EQUIPMENT Provide a service entrance Delta Model LA603 lightning arrestor (LA) and Motor Saver Model 102 power monitor (PM), per component specifications. During power monitor failure all three phase motors shall not be allowed to operate.
 - 2. SCUM PUMP NO.1 Provide a properly sized combination circuit breaker and magnetic starter motor starter, as shown on drawings with the following additional equipment:
 - a. Provide a Control Systems, Inc. Model DC101 Duplex Controller (DC1-2) and Float Module FT101 or approved equal. In the automatic mode the Duplex Controller shall receive start and stop commands from the wetwell float switches.

- 1. High level alarm
- 2. Lag pump start
- 3. Lead pump start
- 4. Pump(s) stop
- 5. Low level alarm
- b. Provide a Control Systems, Inc. Model MM101 Motor Monitor (MM-1) and current transformer or approved equal. The motor monitor shall provide a well positive run signal, monitor proper motor running conditions plus indicate motor running time and motor full load running amperes.
- 3. SCUM PUMP NO.2 Provide the same equipment as provided for Pump No.1.
- 4. CONTROL POWER TRANSFORMER Provide a properly sized dry type, Transformer with 480-volt single phase primary and 120/240-volt single phase, three wire secondary with primary and secondary over current protection and circuit breakers as shown on the drawings.

PART 5 EXECUTION

5.01 WORKMANSHIP

A. Install all materials and equipment in accordance with instructions of manufacturer following the best modern construction practices as approved by Contracting Officer, to conform to the Contract Documents. Workmanship shall be first class, in both

effectiveness and appearance, whether finally concealed or exposed and shall be executed by experienced workmen skilled in this type of work.

5.02 PROTECTION

A. Contractor shall continuously maintain adequate protection of stored materials and installed work. Fixtures and equipment, weather stored under roof or outside, shall be tight-covered with sheet polyethylene or waterproof tarpaulin as protection against dirt rust and moisture. Materials and equipment shall not be stored directly on the ground or in areas where they will be subject to physical injury from vehicular traffic or construction machinery. Equipment shall not be used by other trades as supports for scaffolds or personnel. At the completion of the project, equipment and fixtures shall be cleaned to the satisfaction of the Contracting Officer. Contractor shall take every precaution to avoid damaging other structures on the property or on adjacent property. Repairs made necessary by damage shall be paid by the Contractor.

5.03 IDENTIFICATION

- A. Equipment shall bear the manufacturer's name, trade name, model number, serial number, rating or other information necessary to fully identify and shall not be obscured or covered over. The label of approving agency such as U.L., etc., in every case where a standard has been established for the particular materials, shall be in full view.
- B. All electrical control panels and cabinets shall be identified using engraved laminated plastic nameplates with black lettering on white background. Nameplates shall be one inch high; letting shall be 1/4 inch high. Nameplates shall be fastened to the equipment with a minimum of two brass or stainless steel screws.

5.04 ENGINEERING SUPERVISION

A. The services of a qualified representative of the selected System Supplier shall be provided to inspect the completed installations, suggest all adjustments necessary to place the system in proper operation, and instruct operating personnel in the care and operation for the equipment furnished. A minimum of 10 days and 2 trips start-up service and training operating personnel shall be included. During the first year of operation following acceptance, the System Supplier shall check the calibration and operation of the system at intervals of 6 months to correct any deficiencies covered by the equipment and/or system warranty. These services shall be furnished by the Contractor as a part of the work included under this section for the specifications.

DIVISION 13- SPECIAL CONSTRUCTION

SECTION 13350

EXTERIOR ELECTRICAL BUILDING

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SECTION 13350

EXTERIOR ELECTRICAL BUILDING

PART 1 - GENERAL

1-01 SCOPE OF WORK

A. This section shall include furnishing, unloading at the jobsite, handling, storage and installing a complete Exterior Electrical Building. The Exterior Electrical Building shall house all electrical controls, starters, and other components indicated in the Drawings and these Specifications. The Exterior Electrical Building shall be installed on a reinforced concrete slab at location(s) indicated on the Drawings.

1-02 SUBMITTALS

- A. Submit shop drawings and product data, in accordance with applicable sections of Division 00800, showing materials of construction and details of installation for:
 - 1. Complete description of all materials.
 - 2. Certified shop and installation Drawings showing all details of construction, dimensions, and anchor bolt locations.
 - 3. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 4. A complete bill of materials.
 - 5. The weight(s) of each component.
 - 6. Description of surface preparation and shop painting of components and accessories.
 - 7. Electrical and controls requirements, if any.
- B. In the event it is not possible to conform with certain details of the Specifications, describe completely all non-conforming aspects.

PART 2 - MECHANICAL REQUIREMENTS

2-01 GENERAL

- A. The Exterior Electrical Building shall be prefabricated, modular type, self-contained, skid-mounted.
- B. The Exterior Electrical Building shall be self-framing design utilizing the roof and wall covering panels as the primary structural supporting members.

C. The building shall be supplied complete with all necessary component parts, including lifting devices, to form a complete building system and all parts shall be new and free from defective merchandise and material imperfections.

2-02 DESIGN LOAD COMBINATIONS

A. Design shall consider all load combinations specified by NEMA recommended design practices manual, latest edition. The structural steel skid shall be designed to withstand all shipping and erection loads in addition to normal dead and live loads.

B. Steel Skid

- 1. The steel supporting skid shall be fabricated from standard AISC shapes using ASTM A-36 steel. Provisions shall be made for lifting the building for shipping and erection. The floor plate shall be ASTM A-36 material.
- 2. All structural framing members shall be cleaned by sandblasting with #3 sand until all structural members are blasted to white metal. NOTE: The use of chemical or solvent cleaning of structural steel shall not be permitted by the building manufacturer. Following cleaning, one shop coat of zinc-chromate primer (1.5 mils minimum dry thickness) shall be applied.
- 3. The base of the building shall be adequately sized structural steel members rigidly braced with structural steel cross-members for installation on a concrete slab foundation responsibility by electrical subcontractor.

C. Roof Panels

- 1. Roof panels shall be minimum 18-gauge galvanized steel conforming to G90 (1 1/4 oz.) standards. Minimum yield strength of panel material shall be 36,000 psi. Roof panels shall be factory painted as specified by the project engineer.
- 2. Roof panels shall be installed in a single continuous length from eave line to ridge line and shall be designed to tightly interlock so that no fasteners are required at intermediate points along the panel side laps.
- 3. The building roof shall be peaked or sloped and of such a slope as to preclude excessive buildup of snow.

D. Wall Panels

- 1. Wall panels shall be minimum 18-gauge galvanized steel conforming to ASTM A-525 specifications with the galvanized coating conforming to 690 (1/4 oz.) standards. Minimum yield strength of panel material shall be 36,000 psi. Panels to be on 16-inch centers.
- 2. Each exterior wall panel of the building shall be a single continuous length from the base channel to the roof line of the building at the sidewalls and endwalls of

the building except where interrupted by wall openings.

E. Protective Coatings

All exterior surfaces of the galvanized steel roof covering, wall covering and exterior trim shall receive two (2) factory, spray applied paint coats having a combined coating thickness of 3.8 to 5.2 mils of dry film thickness. Exterior color coating shall meet the following performance standards after ten (10) years continuous exposure in normal atmospheric conditions:

- 1. Panels shall show no evidence of blistering, peeling or chipping.
- 2. Panels shall not show surface chalking in excess of the No. 8 rating D659-44 as established by the American Society of Testing Materials (ASTM).
- 3. Panels, after cleaning, shall not show color change in excess of seven (7) units when measured in accordance with the ASTM D-2244-64T standard.
- 4. Color shall match plant building and generator building.

F. Wall Liner

The interior of the metal walls shall be lined with 18-gauge galvanized steel panels, prepainted white. The liner panels shall be fastened to the wall panel ribs at 32-inch OC with #8 self-drilling fasteners, painted.

G. Ceilings

The metal ceiling system shall consist of interlocking panels of minimum 18-gauge galvanized steel factory painted white. The ceiling system shall be furnished completed with all necessary connectors and fasteners.

H. Insulation

The walls, floor and roof of the Service Center #1 control building shall be insulated to provide the heating and cooling requirements. Provide R11 (walls) and R19 (Ceiling) insulation.

I. Accessories

No metal of any kind such as fasteners, trim, flashings, etc. will be permitted to extend continuously from exterior to interior of building except for bulkhead and service entrance.

J. Doors

All doors shall be of seamless construction on all sides. Door with an enclosure insert at the top and bottom shall not be permitted. All exterior hardware shall be stainless steel, including, but not limited to hinges, screws and threshold. Door shall be

fabricated from 16-gauge galvanized steel and primed with two (2) coats of zinc chromate primer before top coat is applied. Double doors as required, shall be fabricated using the same design criteria as above. A door switch as each door shall be installed with contact closure when door is opened. Pigtail conduit and wiring to junction box. Door handles shall be constructed from stainless steel.

2-03 FLOOR TILE

A. Material

- 1. Tile shall be a 1/8-inch nominal gauge 12" X 12" vinyl Armstrong Excelon or approved equal.
- 2. Vinyl cove base shall be 0.080-inch, gauge 4-inch high with preformed internal and external corner pieces as manufactured by Armstrong or an approved equal.

B. Application

Floor tile and cove base shall be applied in strict accordance with manufacturer's written specifications. Adhesives for tile and for cove base shall be those specifically recommended by the manufacturer.

2-04 LIGHTING

A. Interior Lighting

The building shall be furnished complete with factory-installed fluorescent lighting fixtures, bulbs and a three-way switch at each end of the building located at the door. The illumination level, minimum maintained foot candles, shall be 50 FC at the floor level with 30 FC on the vertical face of each equipment lineup or fixtures within the building.

B. Emergency Lighting

- 1. The building shall be furnished complete with factory-installed emergency lighting.
- 2. This lighting system shall provide immediate emergency light (for at least 30 minutes) upon failure of the normal power source and shall switch off automatically when power is restored. Quartz Halide sealed beam lamps shall be utilized.
- 3. Illumination levels shall be in accordance with API-540, Table 3.

C. Exterior Lighting

The building shall be furnished complete with factory-installed, vaportight, high pressure sodium, wall-mount type lighting fixtures (100-watt, 120-volt high power factor ballast, Lithonia Cat. No. TWL-70SF-EPI or approved equal) bulbs and photo cell as required.

D. Receptacles

The building shall be furnished complete with factory-installed, duplex-type, 120-volt convenience receptacle at each end of the building located by the door.

E. Wiring

The building shall be furnished complete with all interconnecting wiring factory-installed and connected. Each interconnecting wire shall be identified by PVC sleeving, or equivalent, at each end; Brady labels are not acceptable. Wire identification shall match the manufacturer's interconnection drawings. Wiring shall be THHN-THWN insulated. Electrical subcontractor shall make all final connections to lighting panel as required.

2-05 GROUNDING

A. Grounding Connections

The building shall be furnished complete with suitable factory-installed grounding connections which shall bond all electrical equipment enclosure frames/ground buses to the building frame. Grounding system shall provide grounding of all electrical equipment and the building frame. The grounding system shall connect to each end of the ground bus in each assembly of equipment. It shall be constructed of 4/0 AWG stranded copper conductor and shall have provisions for connection to the building grounding grid at each corner of the building.

2-06 FIRE EXTINGUISHER

Fire extinguishers, carbon dioxide type, 10-pound capacity, hand-carried, with hanging bracket, hose horn nozzle and hand squeeze valve control shall be provided near each exit door inside the building.

2-07 HEATING/AIR CONDITIONING

Electric forced-air heating and air conditioning or heat pump shall be provided to automatically maintain summer temperature of 80 degrees F. maximum and winter temperature of 68 degrees F. minimum with insulated walls and ceiling. The contribution of the required electrical equipment to the heat load is to be considered in designing the system.

PART 3 EXECUTION

3-01 INSTALLATION

A. Installation of the Exterior Electrical Building shall be in complete accordance with the recommendations of the Building Manufacturer. All aspects of Building installation, including the foundation, shall be the responsibility of the electrical sub-contractor.

DIVISION 14 – CONVEYING SYSTEMS

(NOT USED)

SECTION 15100

PIPE HANGERS AND SUPPORTS

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PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1-01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions, apply to work of this section.

1-02 DESCRIPTION OF WORK

- A. Furnish hangers to support the required loads. Where necessary, supports shall be designed to permit movement due to expansion and contraction. Where drawings show details of supports and anchors, conform to details shown. Where details are not shown, conform to general requirements specified herein.
- B. "C" CLAMPS shall not be used to support piping.
- C. Do not pierce waterproofing with support bolts.
- D. All ferrous metal hangers and supports not otherwise coated shall be provided with a <u>field</u> applied coat of zinc chromate primer prior to installation. In lieu of field painting the contractor may furnish cadmium plated, or galvanized hangers and supports.

1-03 QUALITY ASSURANCE

- A. All hangers, support, anchors, and guides shall be in accordance with the American National Standard Code for Pressure Piping, ANSI B31.1 with addenda 31.1 OA-69.
- B. Provide an adequate suspension system in accordance with recognized engineering practices, using where possible, standard commercially accepted pipe hangers and accessories.
- C. Horizontal suspended pipe shall be hung using adjustable pipe hangers with bolted hinged loops or turnbuckles. Chains, wire, perforated strap iron or flat steel strap are not acceptable.
- D. Submit fastening methods to the structural engineer for approval and as approved copy to the engineer.
- E. For the purpose of this specification figure numbers for Grinnell products are given; equal products are acceptable.

1-04 DESIGN

- A. Supporting steel not shown for the equipment will be designed, supplied and erected by the Contractor. (The supporting steel is that steel which is connected to the structural steel shown on the drawings and carries the weight of the mechanical items.) This supporting steel design must carry the dead weight and dynamic load imposed by the equipment.
- B. The supporting steel shall be connected to the structural steel in such a manner as not to overload the structural steel. It is the responsibility of the General Contractor, Mechanical Contractor and the steel fabricator to verify that this purpose is accomplished. It is the responsibility of the General Contractor to call to the attention of the Architect-Engineer any deficiency prior to bidding.
- C. Where thermal movement in the pipe line will occur, the pipe hanger assembly must be capable of supporting the line in all operating conditions. Accurate weight balance calculations shall be made to determine the supporting force at each hanger in order to prevent excessive stress in either pipe or connected equipment.

PART 2 - PRODUCTS

2-01 UPPER ATTACHMENTS

A. Wood Construction:

1. Support piping in wood constuction with Side Beam Bracket, Grinnell Fig. 202, Grinnell Fig 128R, using lag screws.

2-02 WALL SUPPORTS

A. Where piping is run adjacent to walls or steel columns welded steel brackets Grinnell Fig. 195 and 199 may be used. The bracket shall be bolted to the wall and a back plate of such size and thickness as to properly distribute the weight.

2-03 FLOOR SUPPORTS

- A. Where pipe lines are located next to the floor and no provision for expansion are required support piping with Grinnell Fig. 258, pipe rest with nipple and floor flange.
- B. Where provisions for expansion are required support piping with Grinnell adjustable pipe stand Fig. 274 or pipe roll stand Fig. 271.
- C. Vertical piping shall be supported at every other floor using riser clamps Grinnell Fig. 261., for steel and cast iron pipe, and copper clad riser clamp Grinnell Fig. CT.121., for all copper piping.

2-04 SUPPORTS FOR PIPING OUTSIDE THE STRUCTURE

A. Support piping outside the structure on adjustable pipe supports Grinnell Fig. 264.

2-05 INTERMEDIATE ATTACHMENTS

A. Supports for horizontal piping shall be all threaded galvanized steel, ASTM A-107, Grinnell Fig. 146., of the following sizes:

Pipe Size	Hanger Rod Diameter
2" and smaller	3/8"
2-1/2" and 3"	1/2"
4" and 5"	5/8"
6"	3/4"
8" to 12"	7/8"
14" and 16"	1"

2-06 PIPE ATTACHMENTS

- A. Hangers for insulated pipe shall be sized to bear on the outside of the insulation.
- B. Hangers for steel and cast-iron horizontal piping where provision for expansion are not required shall be Grinnell Fig. 260., clevis type with vertical adjustment.
- C. Hangers for uninsulated copper pipe 4" and smaller shall be copper plated adjustable band hangers Grinnell Fig. CT.99C., for pipe sizes over 4" provide Grinnell Fig. 260., clevis type hanger with a 4 psf lead saddle at each hanger location.
- D. Hanger for PVC pipe shall be Grinnell Fig. CT.99., adjustable band hanger.
- E. Hangers for steel and copper piping where provisions for expansion are required shall be Grinnell Fig. 171 or Fig 181., adjustable roller hanger with Grinnell Fig. 160., pipe covering protection saddles.
- F. Support hot and cold water piping in spaces behind plumbing fixtures with plastic coated brackets and plastic coated U bolts.
 - G. Pipe guides shall be Grinnell Fig. 256. H.

PART 3 - EXECUTION

3-01 INSTALLATION

A. Support horizontal equipment such as in-line pumps, strainer, air separators, independently of the piping system.

- B. Hang pipe from substantial building structure. Pipe shall not be hung from other piping.
- C. Support each horizontal length of NO-HUB cast iron pipe with in 2-1/2' of each joint and a maximum of 5'-0" on centers.
- D. Provide a hanger within one foot of each elbow.
- E. Provide a hanger within one foot of each riser in addition to the riser clamp support at every other floor.
- F. Unless specified otherwise provide the following support spacing.

1.	<u>Pipe Size</u>	Support Spacing
	1" and smaller	5'-0"
	1-1/4" and larger	10'-0"

SECTION 15117

FABRICATED STAINLESS STEEL SLIDE GATES

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PART 4 – GATE SCHEDULE

FABRICATED STAINLESS STEEL SLIDE GATES

PART 1 - GENERAL

1-01 DESCRIPTION

A. The Gates shall be either self-contained, with yoke and bench stand operators, or non-self-contained, with separate stem guides and operators, in accordance with the requirements of these specifications. Specific gate design and configuration shall be as noted in gate schedule or as shown on plans.

1-02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete, slide gates, weir slide gates, stop planks, operators, operating systems and appurtenances as shown on the Drawings and as specified herein.

1-03 RELATED WORK

- A. Concrete work is included in Sections 03100, 03200 and 03300 contained herein.
- B. Surface preparation, shop priming and field painting is included in Section 09900.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance with Section 00800, showing materials of construction and details of installation for:
 - 1. Complete description of all materials.
 - 2. Certified shop and installation Drawings showing all details of construction, dimensions and anchor bolt locations.
 - 3. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 4. A complete bill of materials.
 - 5. The weight of each component.
 - 6. Description of surface preparation and shop prime painting of gates and accessories.
- B. In the event it is not possible to conform with certain details of the Specifications, describe completely all non-conforming aspects.
- C. Operation and Maintenance Data: Operation and maintenance instructions for each type of equipment shall be furnished to the Contracting Officer as an additional Submittal prior to request for final payment. Operation and maintenance data shall be submitted in accordance with applicable sections of these Specifications.

1-05 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
- B. National Electrical Manufacturers Association (NEMA)
- C. Aluminum Association, Inc. (AA)
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1-06 QUALITY ASSURANCE

- A. The slide gates, weir gates, stop planks, operators, operating stems and appurtenances specified under this Section shall be furnished by manufactures who are fully experienced, reputable and qualified in the manufacturer of the equipment furnished. The slide gates, weir gates, stop planks, operators, operating stems and other related equipment shall be designed, constructed and installed in accordance with the best practices and methods.
- B. A factory representative who has complete knowledge of proper operation and maintenance of the equipment provided under this Section shall be provided for two 8-hour days to inspect installation and to instruct representatives of the Contracting Officer on the proper operation and maintenance of the equipment. At a minimum two separate trips shall be scheduled, one for installation and one for instruction. This work may be conducted in conjunction with the inspection of the installation and test runs as provided under PART 3.
- C. This instruction period shall be scheduled with the Contracting Officer at least 10 days in advance and shall take place prior to start-up and acceptance by the Contracting Officer.

PART 2 - MATERIAL

2-01 FRAME AND GUIDES

- A. The gate frame shall be a rigid, welded unit, composed of the guide rails, cross bars, and headrails (self-contained only), with a clear opening the same size as the waterway, unless otherwise specified.
- B. The guides shall be of structural shapes. The guides will be of sufficient length to support two-thirds (2/3) the height of the slide, when the gate is fully open. On self-contained gates, where the guides extend above the operating floor, they shall be sufficiently strong so that no further reinforcing will be required.
- C. The yoke to support the operating device shall be formed by members welded or bolted at the top of the guides. The yoke shall be sufficiently strong to support the lift forces, without excessive deflection, when subjected to a load of 80-pound pull on the operator.

- D. Additional members will be added to the frame as required in this specification for flushbottom closure, spigots, and "J" bulb seals.
- E. Frames, Rails, Cover Slides, Yokes Stainless Steel ASTM A-276, Type 316.
- F. Fasteners and Anchor Bolts Stainless Steel ASTM A-276, Type 316.

2-02 SLIDE COVER (DISC)

- A. The slide cover shall be plate reinforced with structural shapes welded to the plate.
- B. The slide cover shall not deflect more than 1/360 of the span of the gate under maximum head.
- C. The stem connection shall be either the clevis type, with structural members welded to the slide and a bolt to act as a pivot pin, or a threaded and bolted (or keyed) thrust nut supported in welded nut pocket.
- D. The clevis or pocket and yoke of the gate shall be capable of taking, without damage, at least twice the rated thrust output of the operator at 40 pounds pull.

2-03 STEM

- A. The stems shall be as required for intended service, of suitable length and ample strength. The stem diameter shall be capable of withstanding twice the rated output of the operator at 40 pound pull, and shall be supported such that the L/r ratio for the unsupported part of the stem shall not exceed 200.
- B. Stainless Steel ASTM A-276, Type 304 or 316, as specified

2-04 STEM GUIDES

A. Stem guides shall be fabricated stainless steel with non-metallic bushings, and shall be mounted to heavy cast iron mounting brackets. Guides shall be adjustable in two directions and shall be so constructed that when properly spaced, they will hold the stem in alignment and still allow enough plat to permit easy operation. Stem guides shall be spaced per the recommendations of the manufacturer, but in no case shall spacing exceed an l/r ratio of 200. Brackets shall be attached to the wall by anchor bolts of sufficient strength to prevent twisting or sagging under load.

2-05 OPERATORS

- A. Manually operated lifting mechanisms shall be as indicated on the plan drawings or in the gate schedule.
- B. Handwheel type lifts shall be without gear reduction. The crank operated type shall have either a single or double gear reduction, with a threaded bronze lift nut to engage the threaded portion of the stem.

- C. The lift nut shall be flanged and supported on non-metallic thrust washers, or ball, or roller bearings to take the thrust developed during opening and closing of the gate.
- D. Gears, where required, shall be provided with machine cut teeth for smooth operation.
- E. The gearings and lift nut shall be mounted in a housing which in turn shall be mounted on the yoke of the gate, or separately supported on another structure or pedestal.
- F. Lubrication fittings shall be provided to permit lubrication of all gears and bearings.
- G. Gates which have a width exceeding twice the slide height shall be furnished with tandem interconnected operators with a single input crank.
- H. An arrow shall be cast on the gear housing or handwheel to indicated the direction of rotation to open the gate. A maximum effort of 40 pounds shall be required to operate the gate after it is unseated.
- I. When indicated, all operators shall be furnished with either a graduated, clear plastic stem cover or a galvanized steel pipe stem cover and counter type position indicator to show the position of the gate in tenths of an inch.

2-06 WALL MOUNTING BRACKETS

A. Top wall mounting brackets shall be of fabricated steel and shall be of sufficient size to properly support the lift in its position beyond the wall face. The bracket shall be of sufficient strength to adequately transmit to the structure the lifting forces generated by the lift mechanism without sustaining damage. It shall be slotted holed for mounting to the wall with anchor bolts and shall provide sufficient adjustment to properly orient the lift and stem to the valve.

2-07 FLUSHBOTTOM CLOSURE

- A. When indicated on the plans or in the gate schedule, gates shall be furnished with a flush seal arrangement.
- B. A resilient neoprene seal with a minimum width of exposed face of ¾" shall be securely attached to the frame along the invert, and shall extend to the depth of the guide groove.

2-08 "J" BULB SEALS

A. When an unseating head is shown on the plans, or specified in the gate schedule, the gate shall be provided with "J" bulb seals along the sides, and across the invert (weir gates) or top (standard upward opening) of the gate.

- B. When seals are required completely around opening, a flushbottom closure shall be used on the invert.
- C. Seals shall be mounted either on the frame or disc, such that seals do not protrude into the specified opening of the gate.
- D. Gate shall be furnished complete with ultra high molecular weight (U.H.M.W.) polymer seats which contact the slide face. Ultra high molecular weight bearing strips shall be mechanically retained to lock seat in place.
- E. Rubber ASTM D-2000 BC 610/615 or other suitable composition for extended use in water and sewage.

2-09 FINISH

- A. Mill finish on all stainless steel surfaces with standard shopcoat on lift
- B. Special paint on lift.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Installation of all gates and guides shall be done in a workmanlike manner. Handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's Drawings and recommendations. Frames and guides shall be installed in a true vertical plane and shall be installed with 90-degree corners.
- B. Gates with embedded guides and inverts shall be installed in accordance with the recommendations of the manufacturer subject to the Contracting Officer's approval.
- C. The installation of all gates shall be under the supervision of a representative of the manufacturer furnishing the gates.

3-02 FIELD TESTING

- A. Furnish the services of a factory representative, as provided under PART 1, who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test of the equipment. These services may be combined with those provided under PART 1.
- B. After installation, all slide gates and weir gates shall be field tested at maximum differential head to insure that all items of equipment are in compliance with the specifications, including the leakage requirements. Maximum allowable leakage for slide gates and weir gates shall be 0.1 gallons per minute per foot of perimeter under the design seating head.

C. In the event that any unit fails to meet the above requirements, the necessary changes shall be made and the unit retested. If the unit remains unable to meet the test requirements to the satisfaction of the Contracting Officer, it shall be removed and replaced with a satisfactory unit at no cost.

PART 4 - GATE SCHEDULE

LOCATION	TAG I.D.	SIZE (W X L)	DESIGN HEAD	OPERATOR TYPE	TYPE OF GATE
Influent Pump Station	SLG-101	48" x 48"	10'-0"	Geared Crank w/ Handwheel	Sluice
Influent Pump Station	SLG-102	48" x 48"	10'-0"	Geared Crank w/ Handwheel	Sluice
Influent Pump Station	SLG-103	36" x 36"	17'-0"	Geared Crank w/ Handwheel	Sluice
Headworks	SLG-201	48" x 54"	4'-6"	Geared Crank w/ Handwheel	Sluice
Headworks	SLG-202	48" x 54"	4'-6"	Geared Crank w/ Handwheel	Sluice
Headworks	SLG-203	48" x 54"	4'-6"	Geared Crank w/ Handwheel	Sluice
Headworks	SLG-204	48" x 54"	4'-6"	Geared Crank w/ Handwheel	Sluice
Influent Splitter Box	WG-301	60" x 36"	3'-0"	Geared Crank w/ Handwheel	Weir
Influent Splitter Box	WG-302	60" x 36"	3'-0"	Geared Crank w/ Handwheel	Weir
Influent Splitter Box	WG-303	60" x 36"	3'-0"	Geared Crank w/ Handwheel	Weir
Aeration Basin (2 ea)	SLG-401	48" x 48"	15'-0"	Geared Crank w/ Handwheel	Sluice
Aeration Basin	SLG-402	54" x 54"	15'-0"	Geared Crank w/ Handwheel	Sluice
Aeration Basin	SLG-403	30" x 30"	15'-0"	Geared Crank w/ Handwheel	Sluice
Clarifier Splitter Box	WG-501	60" x 36"	3'-0"	Geared Crank w/ Handwheel	Weir
Clarifier Splitter Box	WG-502	60" x 36"	3'-0"	Geared Crank w/ Handwheel	Weir
Clarifier Splitter Box	STG-501	30" x 24"	2'-0"	Rod Handle	Slide
UV / Flume	STG-801	42" x 108"	9'-0"	Rod Handle	Slide
UV / Flume	STG-802	42" x 108"	9'-0"	Rod Handle	Slide
UV / Flume	STG-803	42" x 80"	6'-8"	Rod Handle	Slide
UV / Flume	STG-804	42" x 80"	6'-8"	Rod Handle	Slide

NOTE: Size (W x L) is clear opening.

SECTION 15118

TELESCOPING (SLIP-SEAL) VALVES

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TELESCOPING (SLIP-SEAL) VALVES

PART 1 - GENERAL

1-01 DESCRIPTION

A. Telescoping valves are used primarily for sludge removal, or liquid level control, and are considered to be fully open when in the lowermost position. The valve tube travels inside a ductile iron riser pipe as shown on Page 15118-6. The nominal riser pipe diameter determines the valve tube diameter. V-notch, flared, or baffled tube tops shall be provided when required by the plan drawings.

1-02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete telescoping valves, operators, operating systems and appurtenances as shown on the Drawings and as specified herein.

1-03 RELATED WORK

- A. Concrete work is included in Sections 03100, 03200 and 03300 contained herein.
- B. Surface preparation, shop priming and field painting is included in Section 09000.
- C. Electrical work, except electric motor operators and controls, is included in Division 16.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance with Section 01330 contained herein, showing materials of construction and details of installation for:
 - 1. Complete description of all materials.
 - 2. Certified shop and installation Drawings showing all details of construction, dimensions and anchor bolt locations.
 - 3. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 4. A complete bill of materials.
 - 5. The weight of each component.

- 6. Description of surface preparation and shop prime painting of telescoping valves and accessories.
- B. In the event it is not possible to conform with certain details of the Specifications, describe completely all non-conforming aspects.
- C. Operation and Maintenance Data
 - 1. Operation and maintenance instructions for each type of equipment shall be furnished to the Contracting Officer in six (6) bound copies.

1-05 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
- B. National Electrical Manufacturers Association (NEMA)
- C. Aluminum Association, Inc. (AA)
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1-06 QUALITY ASSURANCE

- A. The telescoping valves, operators, operating stems and appurtenances specified under this Section shall be furnished by manufactures who are fully experienced, reputable and qualified in the manufacturer of the equipment furnished. The telescoping valves, operators, operating stems and other related equipment shall be designed, constructed and installed in accordance with the best practices and methods.
- B. A factory representative who has complete knowledge of proper operation and maintenance of the equipment provided under this Section shall be provided for two 8-hour days to inspect installation and to instruct representatives of the Contracting Officer on the proper operation and maintenance of the equipment. At a minimum two separate trips shall be scheduled, one for installation and one for instruction. This work may be conducted in conjunction with the inspection of the installation and test runs as provided under PART 3.
- C. This instruction period shall be scheduled at least 10 days in advance and shall take place prior to start-up and acceptance.

PART 2 - MATERIALS

2-01 TUBE (METAL)

A. Brass tubes for 10 inch nominal diameter and smaller valves shall be manufactured from seamless tube or pipe. For 12 inch and larger brass valves the tube shall be of rolled plate construction with the weld seam ground smooth. The finish O.D. of the

- tube is to be \pm .04 inches, cylindrical within .100 TIR and have a smooth, 125 micro inch or better surface.
- B. Stainless steel or steel tubes up through 24" size shall be manufactured from seamless pipe or tube. Steel tubes are to be fusion epoxy coated.
- C. Tube lengths shall be as shown or noted on the drawings and must be of sufficient length to facilitate valve travel and maintain an appropriate insert depth.
- D. Valve tubes are to be a minimum 1/8" thick and are attached to connecting stems by use of a lifting bail.

2-02 SEAL FLANGE

- A. A cast iron or stainless steel companion flange and neoprene slip seal gasket shall be provided by the valve manufacturer.
- B. The gasket must be a minimum 1/4" thick.
- C. The inside diameter of the gasket is to be 1/8" smaller than the outside diameter of the valve tube to provide a friction seal. The gasket is to be sandwiched between the riser pipe flange and the companion flange.
- D. The gasket and companion flange shall include a 125# standard drilling pattern to match the riser pipe.

2-03 LIFTING BAIL

- A. On brass and PVC tubes the lifting bail shall be stainless steel construction and be fastened to the valve body with stainless steel attaching bolts.
- B. On stainless steel and steel tubes, the bail shall be the same material as the tube and be rigidly welded to the tube.

2-04 LIFT AND STEMS (RISING)

- A. Lifts shall be handwheel type, with UHMW polyethylene thrust bearings along with a stub acme threaded type 316 stainless steel stem to provide automatic self-locking, infinite valve positioning.
- B. The standard rising stem lift shall use a galvanized steel square tube with torque nut design to prevent telescoping valve tube rotation. Alternately, where conditions require, a V-keyed shaft, with torque plate, shall be used to prevent valve tube rotation.
- C. Handwheels shall be a minimum of 12" in diameter and shall include a clear plastic Butyrate stem cover with a mylar strip type position indicator, calibrated in ¼ inch increments to illustrate valve position.

- D. The mylar strip, provided by the manufacturer, will be affixed by the contractor after installation to provide a true and accurate indication of the tube elevation by comparing it to the top of the rising stem.
- E. Stainless steel anchor bolts shall be provided for all pedestals.
- F. Cleaning and shop prime coat of lift housing and handwheel will be as specified elsewhere in this specification.

2-05 STEM GUIDES

A. Stem guides shall be fabricated stainless steel with non-metallic bushings, and shall be mounted to heavy cast iron mounting brackets. Guides shall be adjustable in two directions and shall be so constructed that when properly spaced, they will hold the stem in alignment and still allow enough plat to permit easy operation. Stem guides shall be spaced per the recommendations of the manufacturer, but in no case shall spacing exceed an l/r ratio of 200. Brackets shall be attached to the wall by anchor bolts of sufficient strength to prevent twisting or sagging under load.

2-06 WALL MOUNTING BRACKETS

A. Top wall mounting brackets shall be of fabricated steel ad shall be of sufficient size to properly support the lift in its position beyond the wall face. The bracket shall be of sufficient strength to adequately transmit to the structure the lifting forces generated by the lift mechanism without sustaining damage. It shall be slotted holed for mounting to the wall with anchor bolts and shall provide sufficient adjustment to properly orient the lift and stem to the valve.

PART 3 - EXECUTION

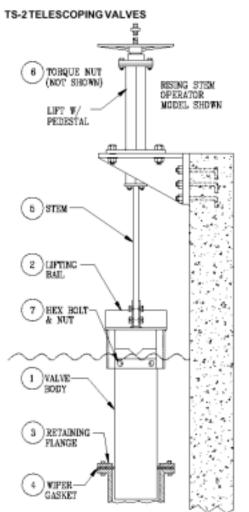
3-01 INSTALLATION

- A. Installation of all telescoping valves shall be done in a workmanlike manner. Handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's Drawings and recommendations. Frames and guides shall be installed in a true vertical plane and shall be installed with 90-degree corners.
- B. The installation of all telescoping valves shall be under the supervision of a representative of the manufacturer furnishing the telescoping valves.

3-02 FIELD TESTING

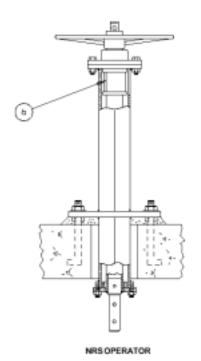
A. Furnish the services of a factory representative, as provided under PART 1, who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test of the equipment. These services may be combined with those provided under PART 1.

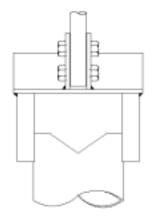
- B. After installation, all telescoping valves shall be field tested at maximum differential head to insure that all items of equipment are in compliance with the specifications, including the leakage requirements. Maximum allowable leakage for telescoping valves shall be 0.1 gallons per minute per foot of perimeter under the design seating head.
- C. In the event that any unit fails to meet the above requirements, the necessary changes shall be made and the unit retested. If the unit remains unable to meet the test requirements to the satisfaction of the Contracting Officer, it shall be removed and replaced with a satisfactory unit at no cost.



TYPICAL INSTALLATION

PARTS		
No.	Name	
1	Valve Body - Commercial Brass.*	
2	Lifting Strap - Stainless Steel ASTM A-276.	
3	Retainer Flange - Cast Iron ASTM A-126 Class B.	
4	Wiper Gasket - Neoprene ASTM D-2000.	
5	Lifting Stem - Stainless Steel ASTM A-276.	
6	Torque Nut -Manganese Bronze ASTM B-584 Al-80	
7	Hex Bolt & Nut - Stainless Steel ASTM F-593	
Or S	04 Stairtens Steel 16 Stairtens Steel VC Pipe	





V NOTCH STYLE STEEL/STAINLESS STEEL

SECTION 15119

WASTE SLUDGE CONTROL VALVE

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WASTE SLUDGE CONTROL VALVE

PART 1 GENERAL

1-01 GENERAL

A. The Contractor shall furnish and install one (1) electrically actuated control valve at the location(s) indicated on the Drawings. All equipment specified herein shall be an integrated system which shall be the product of one (1) manufacturer who will provide single source responsibility for all components. The specific equipment described herein and shown on the plans is manufactured by Red Valve Company, Inc., or of equal manufacture as approved by the Contracting Officer.

Should equipment other than that specified be proposed, the Contractor shall be responsible for any redesign based on the requirements contained herein.

1-02 QUALITY ASSURANCE

A. Supplier shall have at least ten (10) years experience in the manufacture of pinch style valves, and shall provide references and a list of installations upon request.

1-03 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures.

PART 2 PRODUCTS

2-01 ELECTRIC MOTOR OPERATED PINCH VALVES

- A. Valves shall be 6" or larger, of the full cast metal body, mechanical pinch type with flange joint ends. The valve length shall be as given in ISA S75.08. The flanges shall be drilled and tapped to mate with ANSI B16.1, Class 125 / ANSI B16.5, Class 150 flanges.
- B. The sleeve trim shall be one piece construction with integral flanges drilled to be retained by the flange bolts. The sleeve trim shall be reinforced with calendared nylon or calendared polyester fabric to match service conditions. The sleeve trim shall be connected to the pinch bar by tabs imbedded in the sleeve trim reinforcing ply. All internal valve metal parts are to be completely isolated from the process fluid by the sleeve trim.
- C. The fixed pinch bar shall be set to pre-pinch the sleeve so that the minimum full open area is centered in the valve. For full port and reduced port sleeves the port areas shall be 100% of the full pipe area at the valve ends. For Cone and Variable Orifice sleeves the port area at the inlet shall be 100% of the full pipe area, reducing to a smaller port size at the outlet.

D. The solid steel pinch mechanism shall be single acting, closing the sleeve from the top only. The mechanism shall be supported in the valve body. There shall be no cast parts in the operating mechanism. The mechanism shall be connected to the electrically actuated actuator through an ACME threaded stem. The electric motor shall be as specified. The pinch mechanism shall be adjustable for stroke without removing the valve from the line. All valves shall be of the Series 5200-ED as manufactured by the Red Valve Co., Inc. of Carnegie, PA or approved equal.

2-02 ELECTRIC MOTOR OPERATOR

A. An electric motor rotates a threaded nut, pushing a threaded stem into the valve body, pinching the sleeve closed. Reversing the direction of the electric motor pulls the stem out of the valve body, opening the sleeve. Electric motor shall be capable of closing the valve in 60 seconds. Motors will be capable of operating on 480v/3ph/60hz power, or as specified by the project. For modulating applications the input shall be 4/20ma. Acutator housing shall be NEMA 4. Manual operation shall be available by means of handwheel. Mechanically operated torque switches shall be furnished at each end of travel. Torque switches will trip when the valve load exceeds torque switch setting. Actuator shall be Series SAR14.1 as manufactured by AUMA Actuators, Inc. of Pittsburgh, PA or approved equal.

PART 3 EXECUTION

3-01 INSTALLATION

A. Valve shall be installed in accordance with manufacturer's written Installation and Operation Manual and approved submittals.

SECTION 15120

FABRICATED ALUMINUM SLIDE GATES

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FABRICATED ALUMINUM SLIDE GATES

PART 1 - GENERAL

1-01 SCOPE OF WORK

A. This Specification defines the design, materials of construction, fabrication, testing, and supply of Fabricated Slide Gates as shown on the Plans and Specifications. The gates shall be either self-contained or the non-self-contained type with the guides designed to mount on the face of the concrete wall or embedded in the channel wall. The gates shall be designed and sealed by a professional engineer registered in the state where the gates will be designed and manufactured. Manufacturers shall have a minimum of five (5) years experience in the design and manufacture of equipment of this type.

1-02 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures.

PART 2 - PRODUCTS

2-01 GENERAL REQUIREMENTS

- A. The disc or sliding member shall be of aluminum plate ASTM B221 6061-T6 and will be reinforced with U-shaped aluminum extrusions welded to the plate. The disc will be designed to limit deflection of the gate to 1/360th of its span under the design head. The working design stresses shall not exceed the lesser of 40% of the yield strength or 25% of the ultimate strength of the material. All disc components shall have a minimum material thickness of ¼". Aluminum slide gate shall be Rodney Hunt Model #761W or equal as approved by the Contracting Officer.
- B. The guides and inverts shall be of extruded aluminum ASTM B221 6061-T6. The guides shall be designed for maximum rigidity and shall have a weight of not less than 3.0 pounds per linear foot. The guides shall be designed to embed or mount to the face of the concrete and shall be provided with keyways to lock them into the concrete. The invert of the frame shall be welded to the lower ends of the guides. The guides will incorporate an ultra-high molecular weight double-winged polymer strip on both the upstream and downstream side of the disc. The polymer strips will be held in dovetail grooves. The guides shall be designed for maximum rigidity. The invert of the frame will be an aluminum extrusion welded to the lower ends of the guides to form a seating surface for the resilient seal. Where the guides extend above the operating floor, they shall be sufficiently strong so that no further reinforcing will be required. On the self-contained gates, the yoke to support the operating benchstand will be formed by two angles or channels welded at the top of the guides to form a one-piece rigid frame. The design of the yoke will be such to limit its deflection to 1/360th of its span under full operating load.

- C. A specialty extruded resilient neoprene seal will be mounted on the closing surface of the disc or installed to the closing surface member to provide flush closure. The shape of the seal will provide a seating surface having a minimum width of ¾" and the seal will extend into the secondary slot of the vertical guide. The vertical face of the seal will be in contact with the seating surface of the guide to provide a proper seal at the corners. Under design unseating head, the allowable leakage shall not exceed 0.1 gallons per minute per foot of seating perimeter.
- D. Stems shall be ASTM A276 Type 304 stainless steel. Stems shall be designed to transmit in compression a minimum of two times the rated output of the hoist at 40 pounds effort on the operator. The L/r ratio of the unsupported stem shall not exceed 200. Stem guides, where required to limit the unsupported stem length, shall have polymer or bronze bushings. The stems shall be connected to the disc by means of a cast aluminum stem connector bolted to the stem and welded to the disc.
- E. Rising stem gates shall be provided with clear polycarbonate stem covers (ASTM D3935/D707) to provide visual indication of gate position, permit inspection of the stem threads, and to protect the stem from contamination. Vent holes shall be provided to prevent condensation.
- F. The hoist shall be sized to permit operation of the gate under the full operating load with a maximum effort of 40 pounds on the operator. The hoist nut shall be manganese bronze, conforming to ASTM B584 C86500. The hoist nut shall be supported on roller bearings. A lubrication fitting shall be provided for lubrication of the hoist bearings without disassembly of the hoist. Suitable seals shall be provided to prevent entry of foreign matter. The direction of the handwheel or crank operator to open the gate shall be clearly and permanently marked on the hoist. Where the actuators are to be interconnected it shall be by means of a flexible coupling and stainless steel tubing.
- G. All necessary attaching bolts, studs, and anchors will be ASTM A276 Type 304 stainless steel and will be furnished by the slide gate manufacturer.

PART 3 - EXECUTION

3-01 INSTALLATION

A. The gate structure and gate design, details, and installation and maintenance requirements shall be submitted to the Engineer for acceptance prior to the installation of the gate structure and gate. All installation methods and materials shall be as approved by the gate manufacturer and in strict accordance with the manufacturer's requirements.

SECTION 15173

PARSHALL FLUME

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3-02	FRAMES, GRATES AND COVERS
3-03	INSTALLATION
3-04	START-UP

PARSHALL FLUME

PART 1 - GENERAL

1-01 DESCRIPTION

- A. 12" Parshall Flume the flume shall be a 12 inch Parshall flume for measuring flows from 54 to 7,200 GPM
- B. 36" Parshall Flume the flume shall be a 36 inch Parshall flume for measuring flows from 276 to 22,600 GPM

1-02 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures.

PART 2 - MATERIALS

2-01 MATERIAL

- A. The flume shall be full length, molded fiberglass reinforced polyester laminated in one piece.
- B. The interior surface shall have a 10 to 15 mil white gelcoat backed by a resin rich layer of resin and chopped glass forming a water and chemical resistant surface. The remainder of the laminate shall be fiberglass-reinforced polyester containing not less than 30% glass content by weight.
- C. The thickness of the walls and floor of the flume shall be not less than 1/4".
- D. Parshall flumes with a throat width of 3" shall be reinforced with box section stiffeners down the sides and across the bottom. The stiffeners shall be joined together at the knee to form a rigid dimensionally stable flume.
- E. The flume shall be free standing, strong enough to hold a 30" depth of water without visible distortion. There shall be locking clips fastened along the side of the flume to be used for anchorage into the concrete.
- F. Stiffeners across the top shall be permanent FRP pultruded angle/channel or temporary wood spreaders as required for the job, and shall provide sufficient strength and structural support to resist the stresses that occur during shipping and proper installation of the flume.

- G. The flume shall be provided with:
 - 1. An adjustable T-316 stainless steel support bracket to mount an ultrasonic transducer over the waterway.
 - 2. Inlet and/or outlet bulkheads or wingwalls to transition flow between the flume and channel.
- H. The Parshall flume shall be equipped with a molded in head gage graduated in feet and inches. The foot scale shall be graduated in half tenths with 3/4" high black numerals at each tenth. The inch scale shall be graduated every half inch with 3/4" high black numerals at each inch.

2-02 PHYSICAL PROPERTIES

Tensile strength	14,000 psi
Percent elongation	1.65%
Flexural strength	25,000 psi
Flexural modulus	0.90 x 10 ⁶ psi
	Tensile strength Percent elongation Flexural strength Flexural modulus

E. Barcol hardness 30

F. Flume dimensions shall be within plus or minus 1/16th inch.

PART 3 - EXECUTION

3-01 GENERAL: Flume pits shall be constructed as detailed on the Drawings to the dimensions and depths shown.

Unless otherwise specified, metering pits shall be constructed of reinforced concrete to the dimensions shown on the plans. Concrete shall conform to Section 03300 – Cast in Place Concrete contained herein.

- 3-02 FRAMES, GRATES AND COVERS: Frames and covers shall be aluminum unless otherwise specified. Grates shall be aluminum or reinforced fiberglass as specified on the Contract Drawings. Suitable padlocks by Master, or equal, shall be provided for the grate security tie down bar.
- 3-03 The Contractor shall install the flumes in accordance with the manufacturer's recommendations in the presence of the manufacturers authorized representative. Special care shall be taken to ensure installation of flume in the proper position, elevation and alignment.
- 3-04 The equipment manufacturer or their authorized representative shall provide startup and field calibration on each flume installation.

SECTION 15174

ULTRASONIC FLOW METER

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ULTRASONIC FLOW METER

PART 1 - GENERAL

1-01 INSTRUMENT

- A. There shall be furnished a recording, totalizing open channel flow meter suitable for portable or fixed-site monitoring. An ultrasonic sensor shall be used to measure level.
- B. The ultrasonic flow meter locations are on the two parshall flumes (One in the UV structure and one in the RAS screw pump structure)

1-02 ULTRASONIC SENSOR

- A. The sensor shall consist of a single ultrasonic transducer housed in a rugged, watertight, dust-tight, submersible, corrosion resistant (self-certified NEMA 4X, 6 and IP67) Xenoy plastic enclosure. The sensor shall include a temperature probe to automatically compensate for air temperature changes. The sensor shall automatically adjust its gain in response to echo strength to maximize performance in the presence of steam, foam and turbulence. The sensor shall include variable blanking distance to ignore echoes from within a programmable distance from the sensor.
- B. The level measurement span shall be from 0 to 10 feet (0 to 3.05 m). The level shall be measured with a maximum error of +/- 0.02 feet (+/- 0.006 m) over a head change of 1 foot or less (0.31 m or less), and +/- 0.03 feet (+/- 0.009 m) over a head change of 1 to 10 feet (0.31 to 3.05 m). The temperature coefficient shall be +/- 0.000047 per degree F (+/- 0.000085 per degree C) times the distance from the transducer to the liquid surface over the compensated temperature range of -22 to 140 degrees F (-30 to 60 degrees C).
- C. <u>The sensor cable shall be a minimum of 25 feet (7.62 m) long.</u> The cable shall terminate in a sealed, military style connector so that the sensor can be easily replaced in the field. A Quick-disconnect box shall be supplied at the sensor end, and the meter end, to provide for longer runs of sonic cable.

1-03 FLOW METER

- A. Measured liquid level readings shall be converted into corresponding flow rate readings using internal conversion algorithms. The flow meter shall contain conversions for Parshall Flumes.
- B. The flow meter shall be capable of connecting to a rain guage.
- C. The flow meter shall include an input for a pH probe with a built-in temperature probe.

- D. The flow meter shall include an input for a Multi-Parameter Water Quality Monitor. The Multi-Parameter Water Quality Monitor shall include conductivity and temperature probes, and optional pH and dissolved oxygen probes. The Multi-Parameter Water Quality Monitor shall be calibrated using the keypad and display on the flow meter. All other functions related to the Multi-Parameter Water Quality Monitor shall be programmable with or without the Multi-Parameter Water Quality Monitor connected to the flow meter.
- E. The flow meter shall be capable of activating a connected sampler based on an AND/OR combination of any two of level, flow rate, rainfall, pH or dissolved oxygen, temperature, and pH, dissolved oxygen, conductivity, and temperature from a Multi-Parameter Water Quality Monitor.
- F. The flow meter shall have a 12 volt pulse output for signaling a connected automatic sampler to collect flow proportioned samples. The flow meter shall have inputs to accept signals from the sampler indicating when a sample is collected and the bottle in which the sample is placed.
- G. The flow meter shall contain a tactile keypad and a 2 line, 80 character, backlit alphanumeric liquid crystal display (LCD). The LCD shall visually prompt the user through the programming sequence. The LCD shall display level, flow rate, total flow, pH or dissolved oxygen, temperature, and pH, dissolved oxygen, conductivity, and temperature from a Multi-Parameter Water Quality Monitor in user-selectable units of measure. The totalizer on the LCD shall be resettable. The flow meter shall include a non-resettable, mechanical totalizer. The LCD shall display the signal strength from the ultrasonic sensor to aid in installation and troubleshooting.
- Η. The flow meter shall contain a dot matrix printer with a replaceable roll of plain white paper 4.5 in. (11. cm) wide and 65 ft. (19.8 m) long, and a replaceable black nylon ribbon 19.7 ft. (6.0 m) long. The printer shall record up to 3 graphs of level, flow rate, pH or dissolved oxygen, temperature, and pH, dissolved oxygen, conductivity, and temperature from a Multi-Parameter Water Quality Monitor at user-selectable chart speeds ranging from 0.5 to 4 inches (1.25 to 10 cm) per hour. The recording span for each graph shall be userselectable with multiple automatic over-ranges if the maximum scale is exceeded. The chart shall include total flow, time and date, site ID, flow conversion, and recording span for each graph. The printer shall record rainfall data as a bar graph. The printer shall record sampler event marks with bottle number and time. The printer shall provide 2 summary reports of minimum, maximum, average and total data over 2 independent time intervals. The printer shall provide a flow meter history report, including the time when the level, pH or dissolved oxygen, and pH, dissolved oxygen, conductivity, and temperature from a Multi-Parameter Water Quality Monitor were adjusted, the totalizer was reset, or the sampler was enabled. The printer shall provide a sampler history report containing the time and bottle number of each sample. The printer shall print the flow meter program on command.

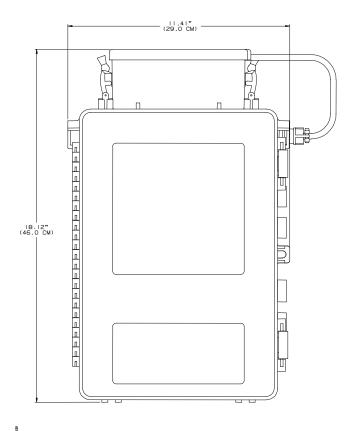
- I. The internal data storage memory in the flow meter shall have a capacity of 80,000 bytes, divided into up to 12 user-defined partitions. Each partition shall be programmable to store level, flow rate, rainfall, pH or dissolved oxygen, temperature, sample data, or pH, dissolved oxygen, conductivity, or temperature from a Multi-Parameter Water Quality Monitor. Timing for the data storage shall be selectable in 1, 2, 5, 10, 15, 30, 60, or 120 minute intervals. Each partition shall be programmable to operate in either rollover, slate or triggered slate mode. Triggering events in slate mode shall be selectable from level, flow rate, rainfall, pH or dissolved oxygen, temperature, and pH, dissolved oxygen, conductivity, and temperature from a Multi-Parameter Water Quality Monitor. The internal data storage memory in the flow meter shall be programmed using a software program on an IBM PC or compatible computer. The software shall also retrieve stored data from the flow meter, and generate graphs and reports from stored data. The computer shall communicate with the flow meter using a direct RS-232 connection.
- J. The flow meter shall include [3] internal isolated analog outputs. Each output shall be programmable to output level, flow rate, pH or dissolved oxygen, temperature, or pH, dissolved oxygen, conductivity, or temperature from a Multi-Parameter Water Quality Monitor. The analog outputs shall be programmable to output 4 to 20 mA or 0 to 20 mA, and the outputs shall be averaged on a programmable time interval of 0, 15, 30 or 60 seconds. The flow meter shall allow the analog outputs to be manually controlled to test the operation of connected equipment. The flow meter shall include an external 4 to 20 mA output interface. The interface shall be programmable to output level, flow rate, pH or dissolved oxygen, temperature, or pH, dissolved oxygen, conductivity, or temperature from a Multi-Parameter Water Quality Monitor.
- K. The flow meter shall have 2 form C relays with user-selectable trip points based on flow rate.
- L. The flow meter shall have an RS-232 serial output to transmit information on all of its current readings. The data on the serial output shall be in ASCII format with values separated by commas. The serial output shall be at 1200, 2400, 4800 or 9600 baud. The flow meter shall output this data in response to the reception of a command on the serial port. The flow meter shall also be programmable to automatically transmit this data on a periodic time interval. The data shall include the flow meter description, ID number, model number, date and time, battery voltage, level, flow rate, total flow, rainfall, pH or dissolved oxygen, temperature, sampler activation status, sample number and bottle number, and pH, dissolved oxygen, conductivity, and temperature from a Multi-Parameter Water Quality Monitor, and a checksum.
- M. The program memory in the flow meter shall be non-volatile, programmable flash memory. The program memory shall be capable of being updated via the serial port on the flow meter without opening the enclosure.
- N. The flow meter shall require 12-volt DC power for operation. Power shall be supplied from a 120 VAC power converter with built-in backup battery.

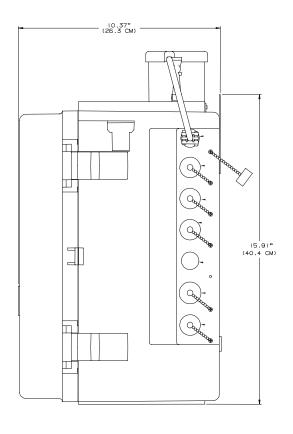
O. The flow meter shall be housed in a rugged, lockable, watertight, dust-tight, corrosion resistant (self-certified NEMA 4X and IP65) enclosure. The enclosure shall include a carrying strap, wall mounting bracket and a clear polycarbonate window for viewing the LCD and printer without opening the enclosure. An internal, easily replaceable, rechargeable desiccant canister shall keep the inside of the flow meter free of moisture.

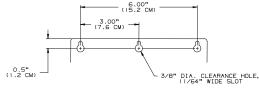
1-04 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures.

Ultrasonic Flow Meter

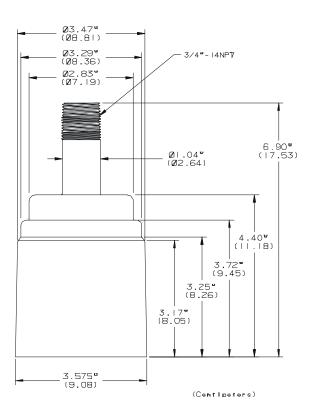






WALL MOUNT BRACKET

Isco Ultrasonic Sensor



DIVISION 15 - MECHANICAL

SECTION 15244

PRESTRESSED COMPOSITE TANKS

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SECTION 15244

PRESTRESSED COMPOSITE TANKS

PART 1 - GENERAL

- 1-01 The circular and elongated tanks (aeration basin and clarifiers) may be constructed using prestressed composite as an alternate to concrete.
- 1-02 The tank floors shall be of concrete or shotcrete construction containing no less than 0.625 percent reinforcing steel in each orthogonal direction and be designed to act as a pile cap foundation.
- 1-03 The wire-prestressed composite wall shall consist of a shotcrete core wall encasing a steel shell diaphragm continuous the full wall height. All prestressing shall be done with high tensile wire, permanently bonded to the tank wall.
- 1-04 The entire tank, including all portions of the floor and wall shall be built by the Contractor, using its own trained personnel and equipment.
- 1-05 The Contractor shall take full liability for the tank from design to construction.

PART 2 - QUALIFICATIONS & EXPERIENCE

- 2-01 The Contractor shall have the following qualifications and experience:
 - A. The Company constructing the tank shall be a firm with at least ten years experience in the design and construction of wire-wound circular and elongated (U.S. Patent No. 5237793) prestressed composite tanks; and shall give satisfactory evidence that it has the skill, reliability, and financial stability to build and guarantee the tank in accordance with the quality required by these specifications. The Company constructing the tank shall have built completely in its own name in the past five years, and be presently responsible for, a minimum of ten (10) circular and elongated prestressed composite tanks of equal size or larger, which meet these specifications and which are now giving satisfactory service.
 - B. The Contractor shall have on its staff a full-time professional engineer, who shall have no less than five years experience in the design and field construction of circular prestressed composite tanks, and who shall be in responsible engineering charge of the work to be done. All working drawings and design calculations shall carry the seal of such registered professional engineer.

PART 3 - GUARANTEE

3-01 The Contractor shall guarantee workmanship and materials on the complete structural portion of the tank for a five-year period from date of acceptance of the work. In case leakage or other defects appear within the five-year period, the Contractor shall promptly repair the tank at its own expense upon written notice by the owner that such defects have

been found. Leakage is defined as a stream flow of liquid appearing on the exterior of the tank, the source of which is from the inside of the tank.

PART 4 - DESIGN CRITERIA

- 4-01 The thickness of the core wall shall be calculated so as to accept the initial compressive forces applied by prestressing, hydrostatic stresses induced by contents, and other applicable loads such as soil backfill and wind.
- 4-02 Backfill loads shall not be used in the design of the core wall to counteract hydraulic loads or provide residual compression in the wall.
- 4-03 The design shall be in conformance with American Concrete Institute (ACI) Title 344R-W "Design and Construction of Circular Wire and Strand Wrapped Prestressed Concrete Structures," and currently accepted engineering principles and practices for the design of such facilities.

	Concrete	
Compressive Strength	$\mathbf{f}_{\underline{\mathbf{c}}}$	3500 psi at 28 days
	Shotcrete	
Compressive Strength	$\mathbf{f}_{\mathtt{g}}$	4000 psi or greater at 28 days
Allowable Compressive Stress	\mathbf{f}_{g}	1250 + 75t with 0.45 f _g maximum*
Allowable Compressive Stress Due to Initial Prestressing Force	\mathbf{f}_{gi}	0.5 f _{gi} or less, with a maximum of 2250 psi (where f _{gi} is defined as compressive strength at time initial prestressing force is applied)

*t = thickness of core wall

Prestressing Wire

Wire Size	Diameter	0.162" (8 gauge), 0.192" (6 gauge) or larger, but no larger than 0.250"
Working Stress, Wall	\mathbf{f}_{s}	115,000 psi
Working Stress, Dome Ring	\mathbf{f}_{s}	120,000 psi
Allowable Tensile Stress Before Losses	$\mathbf{f}_{ m si}$	145,600 psi or no greater than 0.70 f's

Ultimate Tensile Strength

f's 231,000 psi or greater for 8 gauge 222,000 psi or greater for 6 gauge

Reinforcing Steel

Allowable Tensile Stress f_s 18,000 psi

Yield Strength f_y 60,000 psi

PART 5 - SUBMITTALS

- 5-01 Submit to the Contracting Officer complete design calculations and a complete set of detailed working drawings for the tank.
 - A. If a sliding waterstop is used in the floor/wall joint, submit load/shear/deflection data to support shear and deflection calculations for base of wall. Tests must have been generated for the particular waterstop configuration proposed.
 - B. Concrete mix designs.
 - C. Guarantee document as specified in Part 3.

PART 6 - FLOOR

- 6-01 Concrete membrane floors (minimum 4 inches thick) shall have a minimum thickness of 8 inches of concrete over all pipe encasements and around sumps. The minimum percentage (0.625%) of reinforcing steel applies to these thickened sections and shall extend a minimum of 2 feet into the adjacent membrane floor.
- 6-02 Floors shall be vibratory screeded to effect consolidation of concrete and proper encasement of floor reinforcing steel.
- 6-03 Floors shall be continuously water cured until tank construction is completed.

PART 7 - SHOTCRETE WALLS

- 7-01 The core wall and reinforced baffle walls shall be constructed of shotcrete, encasing a steel diaphragm continuous the full wall height without horizontal splices.
- 7-02 The thickness of the core wall shall be calculated so as to accept the initial compressive forces applied by prestressing, backfill, and other applicable loads. The wall may taper uniformly on the outside face from top to bottom as required by design computations. In no case shall the core wall be less than 3-1/2 inches thick. Horizontal sections of the wall shall form true circles without flats, excessive bumps, or hollows.
- 7-03 To compensate for bending moments and for shrinkage, differential drying, and temperature stresses, the following reinforcing steel shall be incorporated in the core wall:

- A. The top 2 feet of core wall shall have not less than 1 percent circumferential reinforcing.
- B. The bottom 3 feet of core wall shall have not less than 1 percent circumferential reinforcing.

C. Inside Face:

- 1. 26 gauge steel shell diaphragm continuous the full wall height without horizontal splices.
- 2. Additional vertical and horizontal reinforcing steel bars as required by design computations.

D. Outside Face:

- 1. Vertical reinforcing steel: minimum of #4 bars at 12 inches center to center.
- 2. Additional vertical and horizontal reinforcing steel bars as required by design computations.
- E. Interior and exterior surfaces of the core wall shall be water cured until prestressing starts.

PART 8 - STEEL SHELL DIAPHRAGM

- 8-01 A 26-gauge steel tank shell, complying with ASTM A-366 for Commercial Quality Cold Rolled Steel, shall be used within and throughout the core wall, providing a positive waterstop. The steel shell diaphragm shall be encased and protected with shotcrete no less than one inch thick at all places. The steel shell is to be so formed and erected that a mechanical key between shotcrete and diaphragm will be created. The sheets of steel diaphragm shall be continuous from top to bottom of wall; horizontal joints or splices will not be permitted.
- 8-02 All vertical joints in the diaphragm shall be sealed watertight by epoxy injection.
- 8-03 Epoxy injection shall be carried out from bottom of wall to top of wall, using a pressure pumping procedure, after the steel shell has been fully encased, inside and outside, with shotcrete. The epoxy sealant shall be suitable for bonding to concrete, shotcrete, and steel. The sealant shall conform to the requirements of ASTM C 881, Type III, Grade 1, and shall be a 100 percent solids, moisture insensitive, low modulus epoxy system. When pumped, maximum viscosity of the epoxy shall be 10 poises at 77 degrees F.
- 8-04 The steel shell design and its epoxy injection procedure (covered by U.S. Patent 5,150,551) shall have been used in the ten tanks required in the Contractor's experience record. No nail or other holes shall be made in the steel shell for erection or other purposes except for inserting pipe sleeves, reinforcing steel, bolts, or other special appurtenances. Such penetrations shall be sealed with an approved epoxy sealant.

- 8-05 In all tanks designed to use a waterstop at the floor/wall joint, the steel shell diaphragm shall be epoxy bonded to this waterstop.
- 8-06 In the reinforced shotcrete baffle walls, vertical wall joints in the diaphragm shall be mechanically crimped.

PART 9 - SHOTCRETE

- 9-01 All shotcrete shall be applied by or under direct supervision of experienced nozzlemen certified in accordance with guidelines by ACI Committee 506. Certification will be accomplished by a recognized authority such as ELF/FC&PA*, ACI, or approved equal.
 - *ELF Engineering Laboratory Forum, Florida Institute of Consulting Engineers

FC&PA - Florida Concrete and Products Association

- 9-02 Shotcrete mixes, measured by weight, shall be:
 - A. First coat on steel shell 1 part cementitious material to diaphragm and prestressing wire: 3 parts sand
 - B. All other shotcrete: 1 part cementitious material to 4 parts sand
- 9-03 Up to 20 percent of cementitious materials may be fly-ash.
- 9-04 Each shotcrete layer shall be broomed prior to final set to effect satisfactory bonding of the following layer. No shotcrete shall be applied to reinforcing steel or diaphragm which is encrusted with overspray. No less than 1/8" thick shotcrete shall separate reinforcing steel and prestressing wire.

PART 10 - STRAIGHT PRESTRESSED WALLS

- 10-01 The core wall shall be constructed of shotcrete encasing a continuous steel shell diaphragm. The reinforcing steel and the shotcrete thickness shall be in accordance with the plans and design calculations.
- 10-02 The straight walls shall be constructed on a footing covered with low friction sheet material to allow longitudinal movement of the wall under prestressing action. Water curing of the straight walls shall be carried out to retard shrinkage until the walls are ready for prestressing.
- 10-03 The straight wall sections shall be linearly prestressed using high strength, seven-wire, low relaxation strand which conform to ASTM A416-90. This strand shall have an ultimate strength of 270 ksi and shall be placed in rigid corrugated flex-tube duct. These ducts shall be permanently grouted after tensioning has been performed. The design of the straight walls shall include an estimate of anticipated linear contraction as a result of the applied prestressing force. Construction of the connecting semi-circular walls and floor slab of the tank shall be delayed until such time as the anticipated contraction has taken place.

PART 11 - HORIZONTAL PRESTRESSING

- 11-01 Circumferential prestressing of the tank shall be achieved by the application of colddrawn, high-carbon steel wire complying with ASTM 821-93 Type B, placed under high tension. A substantial allowance shall be made for prestressing losses due to shrinkage and plastic flow in the shotcrete and due to relaxation in the prestressing steel.
- 11-02 Placement of the prestressing steel wire shall be in a continuous and uniform helix of such pitch as to provide in each lineal foot of core wall height an initial force and unit compressive stress equivalent to that shown on the drawings. Splicing of the wire shall be permitted only when completing the application of a full coil of wire, or when removing a defective section of wire.
- 11-03 Areas to be prestressed will contain not less than 10 wires per foot of wall for 8 gauge and 8 wires per foot of wall for 6 gauge. A maximum of 24 wires per layer per foot for 8 gauge and 20 wires per layer per foot for 6 gauge will be allowed. Shotcrete shall be used to completely encase each individual wire, and protect it from corrosion. To facilitate this encasement, the clear space between adjacent wires is to be no less than one wire diameter.
- 11-04 Prestressing shall be accomplished by a machine capable of continuously inducing a uniform initial tension in the wire before it is positioned on the tank wall. Tension in the wire shall be generated by methods not dependent on cold working or re-drawing of the wire. In determining compliance with design requirements, the aggregate force of all tensioned wires per foot of wall shall be considered rather than the force per individual wire, and such aggregate force shall be no less than that required by the drawings.

PART 12 - MEASUREMENT OF WIRE STRESS

12-01 The Contractor shall supply equipment at the construction site to measure tension in the wire after it is positioned on the tank wall. This stress measuring equipment shall include: electronic direct reading stressometer accurate to within 2 percent; calibrated dynamometers; test stand to field verify the accuracy of the stressometer. The initial tension in each wire shall be recorded.

PART 13 - EXTERIOR COVERCOAT

13-01 After circumferential prestressing wires have been placed, they shall be protected by encasement in shotcrete. This shotcrete encasement shall completely encapsulate each wire, and shall permanently bond the wire to the tank wall. The shotcrete cover shall have a thickness of no less than one inch over the wire. When multiple layers of wire are required, shotcrete cover between layers shall be no less than 1/8-inch thick.

PART 14 - WALL OPENINGS

- 14-01 When it is necessary for a pipe to pass through the tank wall, the invert of such pipe shall be no less than 18 inches above the floor slab, and the prestressing wires required at the pipe elevation shall be distributed above and below the opening, leaving an unbanded strip around the entire tank. Ordinarily, unbanded strips shall have a vertical dimension of no more than 36 inches.
- 14-02 An axi-symmetric finite element shell analysis will be required for unbanded wall spaces having a vertical dimension greater than 36 inches.
- 14-03 All pipe sleeves passing through the wall shall be sealed to the steel shell diaphragm by epoxy injection.

PART 15 - TANK ACCESSORIES

15-01 The Contractor shall furnish, install, and guarantee for five years any appurtenances called for on the cast in place concrete plans.

PART 16 - PAINTING

16-01 Painting of the exposed exterior surfaces of the tank shall consist of two coats Tnemec Envirocrete, Series 156, Porter DTM, or approved equal. All painting shall be done in accordance with the paint manufacturer's recommendations.

DIVISION 15 - MECHANICAL

SECTION 15262

ULTRAVIOLET DISINFECTION EQUIPMENT

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SECTION 15262

ULTRAVIOLET DISINFECTION EQUIPMENT

PART 1 - GENERAL

1-01 DESCRIPTION

A. Scope:

Furnish all materials, equipment and appurtenances required to provide an open channel, gravity flow, high intensity medium pressure lamp, ultraviolet (UV) disinfection system complete with an automatic mechanical/chemical cleaning system and variable output electronic ballasts. The UV system to be complete and operational with all control equipment and accessories as shown and specified herein. This system will be capable of disinfecting effluent to meet the water quality standards listed in this section.

B. Related Work Specified Elsewhere:

- 1. Section 03100 Concrete Formwork
- 2. Section 03200 Concrete Reinforcement
- 3. Section 03300 Cast in Place Concrete
- 4. Section 05530 Gratings and Floor Plates
- 5. Section 16000 Electrical

1-02 QUALITY ASSURANCE

- 1. To be acceptable, the manufacturer must be able to demonstrate, to the satisfaction of the Contracting Officer, successful performance of the proposed medium pressure lamp system at a minimum of fifteen (15) other municipal Wastewater Treatment Plants.
- 2. The manufacturer shall provide a list of at least ten (10) permanent wastewater installations of this equipment type in North America disinfecting a peak flow of 10 MGD or greater that have been operating successfully for at least 12 months. The manufacturer shall provide a list of operating installations with capacities, names and current phone numbers of contacts to establish the qualification of the manufacturer.
- 3. To be acceptable, the manufacturer shall submit third party validation of the equipment headloss through the reactor.
- 4. Submittals shall provide documentation of UV manufacturer's experience with UV disinfection systems in wastewater applications with electronic ballasts.

5. Submittals shall include a complete and detailed proposal of equipment offered, including the number of lamps proposed and a detailed description of any exceptions taken to the specification.

B. Design Criteria:

1. Provide equipment, which shall disinfect an effluent with the following characteristics:

a) Current Peak Flow: 16 US_MGDb) Future Peak Flow: 32 US_MGDc) Average Flow: 6.4 US_MGD

d) Total Suspended Solids: 30 mg/L, 30-day average of grab samples

e) Ultraviolet Transmittance @ 253.7 nm: 65 %, minimum

f) Maximum Mean Particle Size: 30 microns

g) Effluent standard to be achieved: 200 fecal coliform /100mL, based on a 30 day Geometric Mean of daily samples for the effluent standard.

2. The UV system is to be installed in 1 open channel(s) having the following dimensions:

a) Length: 32.7 ft

45 in

c) Depth: 119 in

3. System configuration:

b) Width:

- a) The UV system will consist of 1 complete UV reactor(s), 1 level controller(s) and a system control panel.
- b) The UV system must fit within the UV channel(s) as stated without modification.
- c) The UV system configuration shall be as follows:

• Number of Channels:

• Number of UV Reactors per Channel: 1

• Number of Banks per Reactor: 2

• Number of UV Modules per Bank: 2

• Number of Lamps per UV Module: 12

• Number of Power Distribution Centers: 2

• Number of System Control Centers: 1

• Number of Level Controllers:

C. Performance Requirement:

1. The ultraviolet disinfection system shall produce an effluent conforming to the following discharge permit: 200 fecal coliform /100mL, based on a 30 Geometric Mean fecal coliform. Grab samples shall be taken in accordance with the Microbiology Sampling Techniques found in Standard Methods for the Examination of Water and Wastewater, 19th Ed.

1

2. The system shall be able to continue providing disinfection while replacing UV lamps, quartz sleeves and ballasts, and while cleaning the sleeves.

1-03 SUBMITTALS

- A. Submit for review, engineering drawings showing the following:
 - 1. Complete description in sufficient detail to permit an item comparison with the specifications.
 - 2. Dimensions and installation requirements.
 - 3. Descriptive information including catalogue cuts and manufacturers' specifications for all components.
 - 4. Electrical schematics and layouts.

1-04 GUARANTEE

A. Equipment:

The equipment furnished under this section shall be free of defects in materials and workmanship, including damages that may be incurred during shipping, storage and installation for a period of 12 months from date of start-up or 18 months after shipment, which ever comes first. The severity of the defect will determine the requirement of a site visit. All travel expenses, accommodation, etc for a service visit due to a defect deemed severe by the manufacturer shall be included in the warranty. Travel expenses for procedures classified as routine maintenance (i.e. lamp, sleeve and ballast replacement) are not included under this warranty.

UV Lamps:

The UV lamps are to be warranted for a minimum of 5000 hours in automatic mode on a prorated basis.

PART 2 - PRODUCTS

2-01 MANUFACTURER

- A. The physical layout of the system shown on the Engineering Drawings and the equipment specified herein are based upon the System UV4000TM, as manufactured by Trojan Technologies, Inc., London, Ontario, Canada, or approved equal.
- B. To be acceptable, the UV system must operate in an open channel, be of modular design, use high intensity medium pressure UV lamps, electronic ballasts with multiple power settings, and incorporate an automatic, in-situ, mechanical/chemical cleaning system. UV systems using an air scour technology, or solely mechanical wiping, are not acceptable for the high intensity, medium pressure UV lamp.
- C. Contractors proposing alternate manufacturers shall be responsible to all costs associated with system evaluation and redesign including all electrical, mechanical and civil aspects of the installation.

2-02 DESIGN, CONSTRUCTION AND MATERIALS

A. General:

- 1. All metal components in continuous contact with effluent shall be Type 316 stainless steel.
- 2. All material exposed to UV light shall be Type 316 stainless steel, Type 214 quartz or a suitably UV resistant material.
- 3. The system shall be designed for complete immersion of the UV lamps including both electrodes and the full length of the lamp in the effluent. Both lamp electrodes shall operate at the same temperature and be cooled by effluent. The major axis of the UV lamps shall be parallel to flow. UV systems that operate lamps placed perpendicular to the flow are unacceptable.

B. UV Module:

- 1. Each UV module shall consist of UV lamps mounted on Type 316 stainless steel frame (Type 304 stainless steel for non-wetted parts).
- 2. Each lamp shall be enclosed in an individual quartz sleeve, one end of which shall be closed and the other sealed with compressed o-rings.

- 3. Electronic ballasts to be housed integral to each UV Module. Ballast housed in a separate enclosure located external to the channel that requires mechanical cooling shall not be permitted.
- 4. All wires connecting the lamps to the main power supply shall be enclosed inside the frame of the UV module and not exposed to the effluent.
- 5. Each quartz sleeve to be independently sealed within the module.
- 6. The UV module shall be designed such that operating personnel at the plant can change the lamps and quartz sleeves.
- 7. Protection against earth leakage faults to each module shall be provided through a circuit breaker and a ground fault relay.
- 8. One electronic ballast shall be supplied per lamp for increased electrical redundancy.

C. Module Removal Mechanism (MRM):

- 1. Module removal shall be accomplished by means of an electric hoist mounted to a Type 304 stainless steel structure.
- 2. All controls shall be provided as an integral part of the MRM structure.
- 3. Electrical service for the hoist shall be obtained from the Mechanical System Center.

D. UV Lamps:

- 1. The UV lamps shall be high intensity, medium pressure.
- 2. The UV lamps shall have a total length of 11.81 inches, and an arc length of 9.84 inches.
- 3. The filament shall be significantly rugged to withstand shock and vibration.
- 4. The lamp bases to be resistant to UV and ozone.
- 5. The lamps shall be operated by electronic ballasts at multiple power settings. Lamp output shall be variable from 30% to 100% in sixteen distinct increments.

E. UV Lamp Sleeves:

- 1. Type 214, clear fused quartz tubing.
- 2. Lamp sleeves shall be domed at one end.
- 3. The open end of the lamp sleeve shall be sealed by means of a Type 316 stainless steel sleeve nut which threads onto a sleeve collar and compresses the sleeve o-ring.

F. Effluent Level Controller:

1. Serpentine Level Control Weir

- a) Located at the discharge end of the UV channel.
- b) Designed to maintain a minimum effluent level, within minimal variations as required to keep lamps submerged.

G. Electrical:

- 1. Each bank shall be powered from a Power Distribution Center. Service entrance for power feed termination to be provided.
- 2. Maximum total power consumption rating shall be no greater than 134.4 kW.
- 3. Electrical supply to each Power Distribution Center shall be 277/480 Volts, 3 phase, 4 wire (plus ground), 73.73684210526317 kVA.
- 4. Electrical supply to the Hydraulic Systems Center (HSC) of each reactor shall be 120 Volts, 1 phase, 2 wire (plus ground), 50 Amps.
- 5. Electrical supply to the System Control Center shall be 120 Volts, 1 phase, 2 wire (plus ground), 16.7 Amps.
- 6. Signal wiring interfacing the UV reactor(s) and the System Control Center (SCC), shall be as shown on the Engineering Drawings.
- 7. All local disconnect switches or breakers to be supplied by the Contractor per local code.

H. Power Distribution Center (PDC):

- 1. Enclosure material shall be Type 304 stainless steel.
- 2. Each module sub-system shall be wired from the main power distribution blocks into a circuit breaker.
- 3. All internal components shall be sealed from the environment.
- 4. All PDCs to be CSA approved with a minimum rating of Type 4X.
- 5. All local fused disconnects or breakers to be supplied by Contractors.

I. Control and Instrumentation:

- 1. System Control Center (SCC):
 - a) The basis for system control is a microprocessor based controller, which continuously monitors and controls the UV system's functions. Custom electronics, pressure switches and a water level sensor provide the SCC with the necessary indications of system parameters.
 - b) The operator interface shall be menu driven. Complete control and monitoring of the disinfection system is accomplished through this interface.

- c) The keypad shall have a sealed membrane overlay covering all function keys and numerical keys.
- d) Alarms shall be provided to indicate an extreme alarm condition in which the disinfection performance may be jeopardized. The alarms shall include:
 - i) Bank Low UV Intensity Alarm: Shall be preset at the factory for 25% of the intensity after 100 hours burn-in of the lamps. The alarm set point shall be field adjustable.
 - ii) Lamp Failure Alarm: Failed lamps shall trigger a lamp failure alarm, which identifies the affected UV module by an address system (i.e. bank # / module # / lamp #). The failed lamp(s) are identified using the Bank Control screen lamp graphics.
 - iii) Multiple Lamp/Ballast Alarm
 - iv) Low UV Dose Alarm
- e) The 70 most recent alarms recorded in an alarm history register and displayed when prompted.
- f) Each bank shall be capable of being placed in either Local On, Local Off, Remote Hand, Remote Off, or Remote Auto mode.
- g) The UV banks shall be cycled for equal wear and timed off to minimize bank cycling.
- h) Elapsed time of each bank shall be recorded and displayed on the display screen when prompted.
- i) Panel shall be CSA approved, rated as per use and sized suitable for intended use.

2. On-Line UV Transmission Unit Monitor:

- a) An on-line UVT monitor will automatically track the transmissibility of the effluent at the 253.7 nm germicidal wavelength. The monitoring will be continuous. To ensure valid results, an automatic calibration sequence will be utilized. The UVT monitor will be measured from 0 to 100% with an accuracy of $\pm 1\%$.
- b) A RS-485 serial link to be available for interfacing the UVT monitor with the System Control Center (SCC). This will create an effluent UV demand feedback loop. The SCC will modulate the lamp output in response to the effluent's UVT.
- c) Power feed of 120 Volts, 1 phase, 2 wire (plus ground), 15 Amps required to the sensor sampler at the channel edge.

J. Dose-Pacing:

- 1. A dose-pacing system shall be supplied to modulate the lamp UV output in relationship to a 4-20 mA DC signal from an effluent flow monitor, in conjunction with entered UV transmittance values. Lamp output shall be variable from 30% to 100% in sixteen distinct increments.
- 2. The system to be dose-paced such that as the flow and effluent quality change, the UV dose delivered is optimized while conserving power.
- 3. The dose-pacing system shall allow the operator to vary the design dose setting. This feature is password protected. Logic and time delays shall be provided to regulate the UV bank ON/OFF cycle.

K. Hydraulic Systems Center:

- 1. All cooling system and hydraulic system devices shall be located within the Type 304 stainless steel HSC enclosure.
- 2. The HSC shall contain two coolant pumps per reactor and one hydraulic pump per reactor.

L. Cleaning System:

- 1. The cleaning shall have mechanical and chemical cleaning abilities, complete with an automatically initiated and controlled cleaning cycle.
- 2. The cleaning system, including both the mechanical and chemical components, shall be fully operational *without* requiring either lamps or modules be placed out of service.
- Cleaning cycle intervals to be field adjustable within the range of once/hour to once/500 hours. Manual cleaning system control to be available through the operator interface.
- 4. The system shall be provided with the required cleaning reagents and solutions necessary for initial equipment testing and for equipment start-up.

M Spare Parts:

The following spare parts and safety equipment to be supplied.

- 1. 5 UV Lamps
- 2. 5 Quartz Sleeves
- 3. 5 Lamp/Sleeve Assemblies
- 4. 1 Operator's Kit (including face shield, gloves and cleaning solution)

2-03 MORTAR

- A Type S mortar shall be 1 part Portland cement, 1/2 part hydrated lime or lime putty and 3 parts sand or 1/2 part Portland cement, 1 part masonry cement and 2-3/4 parts sand.
- B Fine grout shall be one part Portland cement, 1/10 part hydrated lime or lime putty, and three pars sand, or one part masonry and 2 3/4 parts sand.

PART 3 - EXECUTION

3-01 INSTALLATION:

In accordance with the contract drawings, manufacturer's engineering drawings and instructions.

3-02 MANUFACTURER'S SERVICES:

- A. Installation supervision: As required for proper installation via phone or fax.
- B. Start-up and field-testing: 2 weeks on site, which includes 2 full days on site for operator training.
- C. Service scheduling: On request during the warranty period.

DIVISION 15 - MECHANICAL

SECTION 15350

INFLUENT PUMPING STATION

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SECTION 15350

INFLUENT PUMPING STATION

PART 1 - GENERAL

1-01 DESCRIPTION

- A. General: In accordance with the requirements of these Technical Specifications, the Contractor shall furnish, construct and place into operation the Short Fork WWTF influent pumping station specified on the Drawings.
- B. The Contractor shall be required to furnish all equipment, materials, labor and tools incidental to the work; perform all excavation, trenching, dewatering, sheeting, shoring, bracing and backfilling; connect and test all electrical and mechanical work; and complete the installation ready for use by the Owner.
- C. Wherever Contractor's work borders, connects to or affects work by other Contractors or contracts, Contractor shall coordinate his work to minimize inconvenience to the total job effort. Where others construct the force main from the pump station and are required to "prove" same by pigging, Contractor shall have his personnel present to operate the pumps during the pigging operation, at no additional cost.

1-02 SUBMITTALS

- A. The Contractor shall submit to the Engineer shop drawings and manufacturer's catalog sheets on all equipment, piping, electrical, and mechanical work prior to initiating any work on same. Six (6) copies of the submittals should be transmitted, bound in durable binders.
- B. The Contractor shall submit shop drawings of other items when requested by the Engineer.
- C. The sewage pumps shall be factory tested prior to incorporation into the work. Manufacturer's certifications of pump flow and head delivery and rating curves shall be submitted in duplicate to the Engineer for review.

1-03 APPLICABLE CODES

- A. All pressure piping shall be completed in accordance with ASME requirements, where applicable.
- B. All electrical work shall conform to NEC requirements, where applicable.
- C. Any other City, County or State Codes in force in the area of the work.
- D. Concrete wetwell shall be in accordance with construction plans and specification Division 3 Concrete.

1-04 STATION DESCRIPTION

- A. The Influent Pumping Station shall consist of a twin wetwell cast in place concrete structure with integral influent chamber and valve pit. The twin wetwells will each accommodate three submersible pumps. A total of four pumps will be installed, two (2) large and two (2) small. The station initial capacity will be from 700 GPM to 7,000 GPM, expandable to 21,000 GPM.
- B. In accordance with the requirements of this Section, the Contractor will furnish and install the influent pumping station. The pumps shall be designed to operate submerged. The pump motors and flexible power conduits will be constructed absolutely watertight.
- C. The Contractor shall furnish and install an automatic control system, all piping and valves, appurtenances and a jib crane to provide a complete operable system. The Contractor shall also be required to furnish all equipment, materials, labor and tools incidental to the work; perform all excavation, trenching, dewatering, sheeting, shoring, bracing, and backfilling; connect and test all electrical and mechanical work; and complete the installation(s) ready for use by the Owner.
- D. The two large pumps shall be driven by Variable Frequency drives in accordance with Division 16 specifications.

PART 2 - MATERIALS

- 2-01 SOURCE OF MATERIALS AND EQUIPMENT: The Contractor will furnish only approved products of domestic manufacture for incorporation into the permanent work. This requirement shall not be interpreted to permit any manufacturer's warranty to operate in lieu of the Contractor's warranty. All four pumps supplied and installed in the Influent Pumping Station shall be from the same manufacturer.
- 2-02 OPERATING CONDITIONS: Each pump shall be capable of delivering the required volume of raw unscreened sewage against the specified total dynamic head set forth hereinbelow or on the Construction drawings. All openings and passages shall be large enough to permit the passage of a sphere three inches (3") in diameter and any trash or stringy material which can pass through a four inch (4") diameter house collection system.

2-03 LARGE PUMPS

A. GENERAL: Furnish and install a quantity of 2 14" pull-up submersible pumping unit(s), UL Listed for explosion proof Class I, Division 1, Groups C and D hazardous locations. The pumps shall be clockwise rotation and connect to the discharge piping when lowered into place.

B. CONDITIONS OF OPERATION:

1. Each pump shall provide the following hydraulic conditions:

Design Condition	Primary Condition
Capacity	7,000 GPM
Total Dynamic Head	67.5' TDH
% Efficiency, (minimum	
hydraulic)	81% EFF
Maximum Speed	1200 RPM
Minimum Shutoff Head	58 Feet
Maximum Shutoff Head	100 Feet
NPSHR	21.5 Feet
Minimum Solid Size	5.25 Inches

- 2. Minimum net positive suction head available (NPSHA) at the centerline of the pump impeller is 32 feet at 7,000 GPM. Liquid is wastewater.
- C. IMPELLER: The impeller shall be 15.75" diameter vane, enclosed, single suction, non-clogging type designed to pass a minimum sphere size of 5.25". Wiper Vanes on the impeller back shroud are not allowed. The impeller is to be dynamically balanced and secured to the shaft by means of a key, and impeller bolt (locknut on 18" and 20") and matched to the volute. The impeller is adjustable by the use of shims to restore the wear ring clearance in the field.
- D. WEAR RINGS: Axial type removable wear rings are to be provided on both the impeller and suction head. They shall provide a seal between the impeller and fronthead for reduction of recirculation. The impeller wear ring shall be approximately 50 Brinell softer that the fronthead ring.
- E. VOLUTE AND SLIDING BRACKET: Volute is to be cast with extra thick walls made of close-grained cast iron conforming to ASTM A48, Class 30. It is to be one-piece, constant velocity equalizing pressure with smooth fluid passages large enough to pass any size solid that can pass through the impeller. The volute shall have an integral tapered suction inlet area to direct flow to the impeller eye and have a centerline flanged discharge. Volute discharge shall be minimum 14" diameter as measured on the inside diameter of the discharge flange opening. Volute shall be fitted with an axial (face-type), stainless steel wearing ring with a minimum 410-484 Brinell hardness.

The sliding bracket assembly shall be a part of the pumping unit constructed so that when lowered to the discharge base/elbow, the knifing action of the vertical metal-to-metal seal provides a self-cleaning, non-clogging, non-sparking UL Listed explosion-proof assembly.

F. GUIDE RAIL/BRACKET: Two rails shall be provided to guide the pump when being raised or lowered in the sump and mount on the discharge base/elbow. Single rail or cable guide systems are not acceptable. The rails shall align the pump with the discharge elbow as it is lowered into place. A ductile iron upper rail guide bracket shall

be furnished to support and align the rails at the top of the sump. For rail lengths greater than 20 feet, a stainless steel intermediate rail guide bracket shall be included.

- G. DISCHARGE BASE: The installation shall include a rigid discharge base-elbow to support the total weight of the pumping unit. The base is to be bolted directly to the floor with the 90 degree elbow having a 125 lb. ANSI flange discharging vertically.
- H. MOTOR: Pump(s) shall be driven by completely sealed, electric submersible squirrel cage induction motors with a maximum NEMA nameplate rating of 200 HP, 1.15 service factor, 1185 RPM, 480 volts, 3-phase, 60 Hertz. The motor nameplate horsepower rating should exceed the brake horsepower requirements of the specified head and capacity conditions and have a minimum full load efficiency of 80%.

Submersible equipment shall be UL Listed for Class I, Division 1, Groups C and D explosion-proof hazardous locations as defined by the National Electric Code. All electrical parts shall be housed in an air-filled cast iron, watertight enclosure which is sealed by the use of O-rings and rabbeted joints with extra large overlaps. The motor cooling system shall be water jacketed.

The stator-winding and lead shall be insulated with moisture-resistant Class F insulation for continuous duty in 40 degree C ambient. The motor shall be designed for continuous duty capable of ten (10) starts per hour. Automatic reset, normally closed thermal overloads shall be imbedded in the motor windings to provide overheating protection. Motor winding thermostats must be connected to an electric controller per local and state codes and the National Electric Code.

Motor shaft shall be one-piece, 416 stainless steel. Carbon steel shafts or shaft sleeves are not acceptable. Rotor is to be dynamically balanced to meet NEMA vibration limits; all external hardware is to be stainless steel. Cable leads are to enter at the top of the motor, and are to allow the cable-to-motor connection to be accomplished in the field without soldering. All power and control lead wires are to be double sealed as it enters the motor in such a manner that cable-wicking will not occur. This sealing system shall consist of a rubber grommet followed by epoxy that is high in adhesive qualities and has a low coefficient of expansion. Each cable wire is to have a small section of insulation removed to establish a window area of bare wire and each wire is to be untwisted and surrounded by epoxy potting material. A cable strain relief mechanism shall be an integral part of this sealing system. Cable sealing system shall be capable of withstanding an external pressure test of 1200 PSI as well as a cable assembly pull test as required by Underwriters Laboratories. Singular grommet or other similar sealing systems are not acceptable. Motor shall be supplied with 80 feet of multi-conductor type "SOW-A" or "W" power cable and control cable. Cable sizing shall conform to NEC specifications and be UL Listed.

Power and control leads shall be terminated on a sealed terminal board. The terminal board and its bronze lugs shall be O-ring sealed.

Pump(s) shall be provided with two separate tandem-mounted mechanical seals to prevent the pumped liquid from entering the rotor/stator cavity area to ensure reliability of operation. The upper and lower seals are mounted to rotate in the same direction.

The upper seal is to be completely immersed in an oil bath and seals the oil chamber and the motor housing. The lower seal mating surfaces are to be immersed in the oil bath sealing the pump volute and the oil chamber. Each seal shall be held in contact by its own spring system and require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The lower seal spring shall be protected from trash in the pumped fluid by a spring cover, which extends over the entire length of the compressed seal spring. Pressure generated by the pump assists in sealing the mating surfaces of the lower seal.

Seal materials for the upper seal shall be stainless steel and Buna-N components, silicon carbide on 440 frames rotating face and tungsten carbide on 440 frames stationary face.

Two moisture detection probes shall be installed so that they will detect moisture in either the seal or stator cavity measuring resistivity between the probes. They shall be wired internally to the control cable connection at the top of the motor. Float type devices located in the rotor/stator area or single probe-to-ground moisture detectors measuring continuity are not acceptable. O-ring sealed plugged ports for filling and draining the oil shall be provided in the mechanical seal oil chamber for ease in inspection, draining and filling of oil.

The pump shall rotate on a minimum of two bearings permanently lubricated but capable of being re-greased, suitable for a minimum L10 bearing life of 40,000 hours. A stainless steel lifting bail will be supplied on the motor, sufficient to carry the load of the motor, pump, cable and pull-up attachment. All mating surfaces shall be machined and fitted and sealed with O-rings. Fittings shall be accomplished by metal-to-metal contact between each machine surface, resulting in controlled compression with O-rings, without requirement of a specific torque limit. No secondary sealing compound shall be used.

A heavy-duty stainless steel lifting bail shall be included and be of adequate strength to lift the entire pump and motor assembly.

I. QUALITY ASSURANCE: Pumps are to be engineered, manufactured and assembled in the United States under a written Quality Assurance program. This written Quality Assurance program is to be in effect for at least five (5) years, and include a written record of periodic internal and external audits to confirm compliance with UL Quality Assurance specifications.

2-04 SMALL PUMPS

A. GENERAL: Furnish and install a quantity of 2 4" pull-up submersible pumping unit(s), UL Listed for explosion proof Class I, Division 1, Groups C and D hazardous locations. The pumps shall be clockwise rotation and connect to the discharge piping when lowered into place.

CONDITIONS OF OPERATION:

1. Each pump shall provide the following hydraulic conditions:

Design Condition	Primary Condition
Capacity	700 GPM
Total Dynamic Head	57.5' TDH
Maximum Speed	1200 RPM
Efficiency (min. hydraulic)	68 %
Shutoff Head	71.1 Feet
NPSHR	6.78 Feet
Minimum Spherical Solid Size	3 Inches

- 2. Minimum net positive suction head available (NPSHA) at the centerline of the pump impeller is 16 feet at 700 GPM. Liquid is wastewater.
- C. IMPELLER: Impeller shall be matched to its constant velocity equalizing pressure volute, and be of the one-piece, single suction, enclosed two-vane (or bladeless), radial flow design with large openings, blunt well-rounded leading edges thick hydrofoil shape tapered to the trailing edge, and a circular flow pattern to prevent the accumulation of solids and stringy material. It is to be balanced and secured to the shaft by means of a key and fastener. Wiper vanes are not allowed. Impeller waterways and clearance between the pump's full diameter impeller periphery and volute cutwater shall be capable of passing a 3" solid sphere. Impeller shall be trimmed to specifically meet the conditions of operation and be fitted with an axial (face-type), stainless steel wear ring with a minimum 300-350 Brinell hardness. The impeller is adjustable by the use of shims to restore the wear ring clearance in the field.
- D. VOLUTE AND SLIDING BRACKET: Volute is to be cast with extra thick walls made of close-grained cast iron conforming to ASTM A48, Class 30. It is to be one-piece, constant velocity equalizing pressure (except 4" 5435 which is specifically designed with a circular volute to minimize radial loads at low flows) with smooth fluid passages large enough to pass any size solid that can pass through the impeller. The volute shall have an integral tapered suction inlet area to direct flow to the impeller eye and have a centerline flanged discharge. Volute discharge shall be minimum 3" diameter as measured on the inside diameter of the discharge flange opening. Volute shall be fitted with an axial (face-type), stainless steel wearing ring with a minimum 410-484 Brinell hardness.

The sliding bracket assembly shall be a part of the pumping unit constructed so that when lowered to the discharge base/elbow, the knifing action of the vertical metal-to-metal seal provides a self-cleaning, non-clogging, non-sparking UL Listed explosion-proof assembly.

E. GUIDE RAIL/BRACKET: Two rails shall be provided to guide the pump when being raised or lowered in the sump and mount on the discharge base/elbow. Single rail or cable guide systems are not acceptable. The rails shall align the pump with the

discharge elbow as it is lowered into place. A ductile iron upper rail guide bracket shall be furnished to support and align the rails at the top of the sump. For rail lengths greater than 20 feet, a stainless steel intermediate rail guide bracket shall be included.

- F. DISCHARGE BASE: The installation shall include a rigid discharge base-elbow to support the total weight of the pumping unit. The base is to be bolted directly to the floor with the 90 degree elbow having a 125 lb. ANSI flange discharging vertically.
- G. MOTOR: Pump(s) shall be driven by completely sealed, electric submersible squirrel cage induction motors with a maximum NEMA nameplate rating of 20 HP, 1.15 service factor, 1180 RPM, 480 volts, 3-phase, 60 Hertz. The motor nameplate horsepower rating should exceed the brake horsepower requirements of the specified head and capacity conditions and have a minimum full load efficiency of 68%.

Submersible equipment shall be UL Listed for Class I, Division 1, Groups C and D explosion-proof hazardous locations as defined by the National Electric Code. All electrical parts shall be housed in an air-filled cast iron, watertight enclosure which is sealed by the use of O-rings and rabbeted joints with extra large overlaps. The motor cooling shall be water jacketed.

The stator-winding and lead shall be insulated with moisture-resistant Class F insulation for continuous duty in 40 degree C ambient. The motor shall be designed for continuous duty capable of ten (10) starts per hour. Automatic reset, normally closed thermal overloads shall be imbedded in the motor windings to provide overheating protection. Motor winding thermostats must be connected to an electric controller per local and state codes and the National Electric Code.

Motor shaft shall be one-piece, 416 stainless steel. Carbon steel shafts or shaft sleeves are not acceptable. Rotor is to be dynamically balanced to meet NEMA vibration limits; all external hardware is to be stainless steel.

Cable leads are to enter at the top of the motor, and are to allow the cable-to-motor connection to be accomplished in the field without soldering. All power and control lead wires are to be double sealed as it enters the motor in such a manner that cable-wicking will not occur. This sealing system shall consist of a rubber grommet followed by epoxy that is high in adhesive qualities and has a low coefficient of expansion. Each cable wire is to have a small section of insulation removed to establish a window area of bare wire and each wire is to be untwisted and surrounded by epoxy potting material. A cable strain relief mechanism shall be an integral part of this sealing system. Cable sealing system shall be capable of withstanding an external pressure test of 1200 PSI as well as a cable assembly pull test as required by Underwriters Laboratories. Singular grommet or other similar sealing systems are not acceptable. Motor shall be supplied with 80 feet of multi-conductor type "SOW-A" or "W" power cable and control cable. Cable sizing shall conform to NEC specifications and be UL Listed.

Power and control leads shall be terminated on a sealed terminal board. The terminal board and its bronze lugs shall be O-ring sealed.

Pump(s) shall be provided with two separate tandem-mounted mechanical seals to prevent the pumped liquid from entering the rotor/stator cavity area to ensure reliability of operation. The upper and lower seals are mounted to rotate in the same direction.

The upper seal is to be completely immersed in an oil bath and seals the oil chamber and the motor housing. The lower seal mating surfaces are to be immersed in the oil bath sealing the pump volute and the oil chamber. Each seal shall be held in contact by its own spring system and require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The lower seal spring shall be protected from trash in the pumped fluid by a spring cover which extends over the entire length of the compressed seal spring. Pressure generated by the pump assists in sealing the mating surfaces of the lower seal.

Seal materials for the upper seal shall be stainless steel and Buna-N components, carbon rotating face and Ni-resist stationary face. Lower seal construction shall be stainless steel and Buna-N components, silicon carbide on 440 frames rotating face and tungsten carbide on 400 & 440 frames stationary face. Silicon carbide rotating face against tungsten carbide stationary face.

Two moisture detection probes shall be installed so that they will detect moisture in either the seal or stator cavity measuring resistivity between the probes. They shall be wired internally to the control cable connection at the top of the motor. Float type devices located in the rotor/stator area or single probe-to-ground moisture detectors measuring continuity are not acceptable. O-ring sealed inspection plugs shall be provided in the mechanical seal oil chamber for ease in inspection, draining and filling of oil.

The pump shall rotate on a grease lubricated-for-life thrust bearing (oil lubricated on 210 frame) and oil lubricated radial bearing with a minimum L10 life of 40,000 hours. Lower shaft bearings shall be locked in place to prevent shaft movement and to take thrust loads.

A heavy-duty stainless steel lifting bail shall be included and be of adequate strength to lift the entire pump and motor assembly.

- H. QUALITY ASSURANCE: Pumps and motors are to be engineered, manufactured and assembled in the United States under a written Quality Assurance program. This written Quality Assurance program shall have been in effect for at least five (5) years, and include a written record of periodic internal and external audits to confirm compliance with UL Quality Assurance specifications.
- 2-05 SYSTEM POWER CHARACTERISTICS: Electrical power furnished to the site will be 480 volt, 3-phase as stated on the Contract Drawings.
- 2-06 ELECTRICAL CONTROL PANEL
 - A. See Division 16 Electrical,

- GENERAL: The control panel shall consist of a circuit breaker and magnetic starter for the pump, actuated by mercury float switches. The control assembly shall provide means to operate the pump manually or automatically.
- B. ENCLOSURE: Control panel shall have a NEMA III R, rainproof enclosure with separate removable inside base plate to mount all components. The outside door shall have provisions for locking.
- C. COMPONENTS: A circuit breaker and magnetic starter with 3 leg overload protection shall be provided for each pump. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. Starter shall have auxiliary contact to operate both pumps on override conditions. If the pump circuit breaker trips, power shall still be available, and maintained, for the control circuit. H-O-A switches and run lights shall be supplied for the pump. A terminal strip shall be provided for connecting control wires, alarm, heat sensor, and seal sensor wires. The control panel shall include a transformer, where necessary, to reduce control voltage to 115 volts. A phase failure monitor and lighting arrestors shall be included.
- D. OPERATION: Mercury tube switch level controls shall be provided to operate the system. Four level controls shall be used for automatic operation. The lower control shall be set at the cut-off level, the second control at the required cut-on level, the override control set above the second control, and the fourth control to actuate the high water alarm.
- E. ALARM: A flashing alarm light shall be furnished on the control panel. The alarm light shall flow dim at all times except under alarm conditions. The light shall then glow bright and flash.
- F. ELAPSED TIME METERS: Six digit elapsed time meters (non reset type) shall be connected to each motor starter to indicate the total running time of each pump in "hours" and "tenths of hours." An elapsed time shall also be installed to indicate the total running time when the average flow pumps run simultaneously.

2-07 VALVES

- A. Gate Valves Shall comply with the latest edition of AWWA C-509. Gate valves shall be iron body, encapsulated high strength cast iron wedge, resilient seat, non-rising stem, and shall open counterclockwise. All gate valves shall have a maximum working pressure of 200 PSI and be tested at 400 PSI. The thrust collar and other bearing surfaces shall be permanently lubricated with oil. Gate valves shall be equipped with mechanical joint connections unless otherwise specified. All valves 16" and larger shall be furnished with bevel gearing for horizontal installation. Valve boxes will be required for each valve.
- B. Check Valves Shall be iron body, swing type, outside lever and weight with straight away passage of full pipe area and renewable bronze seat ring with resilient faced disc and shall comply with the latest edition of AWWA C-508.

2-08 PRESSURE GAGES:

- A. Each pump discharge line shall have installed by 3/4" tap with wye strainer and corporation stop, a liquid filled pressure gage with minimum 3" diameter face. Gages shall be capable of reading pressures from o to 80 psi. Gages shall be removable by threaded fitting for calibration and service.
- 2-09 SLEEVE INSERT TYPE JIB CRANE: Crane shall be positioned as indicated on contract drawings. Crane shall have the following characteristics:
- A. Capacity shall be a minimum of 10,000 lbs (5 tons)
- B. 360° turning radius
- C. Boom span shall be 24' from center with a clearance under boom of 16'.
- D. Crane shall be supplied with and electric chain hoist capable of lifting 5 tons from a depth of 70 'minimum. Hoist shall be 3-phase, 460 volt, and dual speed. Hoist shall be controlled be a pushbutton station and shall be ratted for continuous exterior exposure.
- E. The design factor for the stresses in the crane shall be based on the capacity plus 25% of the rated load for impact and 15% of the rated load for the weight of the hoist and trolley.
- F. The boom or I-Beam shall be designed to meet all specifications utilizing the factor of 25% of rated loaded for impact and 15% or rated load for hoist and trolley weight. This factor (capacity x 1.4) shall be used to determine the stresses in the boom. Capacity plus 15% (capacity x 1.15) shall be utilized to calculate the deflection.
- G. The head assembly shall be constructed of standard plate, angles, and channels, and shall be designed to provide minimum deflection and maximum strength and rigidity.
- H. The top bearing assembly shall utilize a Timken tapered roller bearing with a grease fitting to provide proper lubrication. The bearing shall be designed for a B-10 bearing life of 5,000 hours, according to Crane Manufacturers Association of America, Inc. (CMAA) specification.
- I. The roller assembly shall be constructed of a formed channel, rollers containing two Timken tapered roller bearings each, a grease fitting for easy lubrication, a hex bolt and self locking nut, and two threaded adjustment rods. The trunnion roller assembly shall be designed for easy adjustment of the head in leveling the jib boom, and the bearings shall be designed for B-10 life of 5,000 hours, CMAA specifications.
- J. Crane shall be equipped with a safety channel to safeguard against dislodgment of the head assembly. The channel and angle arrangement shall allow the bearing to be positioned about 8½" below the boom. The bearing used shall be a Timken tapered roller bearing.

- K. Crane shall be supplied with a bottom entry collector ring to allow electrification to be supplied to the hoist without regard for any overhead wiring. Ring assembly shall include a fully weatherized dust cover for protection in an outdoor environment.
- ACCESS COVERS: The floodtight/gastight floor access door shall be the clear 2-10 opening size specified on the plans. Door leafs shall be 1/4 inch thick aluminum diamond plate reinforced to a 1560 p.s.f. live load (capable of holding up to 25 ft. head of water). The bottom of the cover shall have a continuous groove to securely hold a 9/16 inch diameter EPDM gasket around its perimeter. The cover shall have stainless steel watertight cam locks to compress the gasket so that the hatch will not leak from standing water and/or gas leaking from the pump station. The frame shall be 3/8 inch thick material with 3/16" x 1-1/2" anchor straps welded at 18 inches on center around the perimeter of the hatch. The floor access door shall be equipped with a flush watertight handle that does not protrude above the cover, and a stainless steel automatic hold open arm with a red vinyl grip to lock the cover in the open position. The door shall have stainless steel hinges with stainless steel flat head bolts. All parts of the frame and cover shall be aluminum or stainless steel. Installation shall be in accordance with the manufacturer's recommended instructions. Manufacturer shall guarantee against defects in materials and workmanship for a period on ten (10) years. All access openings shall be fitted with a permanently installed fall through prevention net system that is easily retractable for access to the opening below. The fall through prevention system shall consist of the following components:
 - 1. A safety net manufactured from high strength polyester netting that has been tested and certified to meet the current OSHA standard 1926.502 (c) (4) (i) drop test.
 - 2. All stainless steel 316 hardware, hooks and anchors.
 - 3. A permanently attached metal tag with the following information: Name of the test manufacturer; Identification of the net material; Date of manufacture; Date of prototype test; Name of testing agency; and Serial number.

Instructions necessary for proper installation of the net system shall be provided by the net system manufacturer. Installation shall be in accordance with the manufacturers instructions. The complete assembly, including the net shall be warranted against defects in material and workmanship for a period of 1 year from the date of purchase.

VENTILATOR SYSTEM: Supply/exhaust ventilators are axial belt driven units mounted inside a louvered metal housing for filtered air supply/exhaust. Units shall be the roof-mounted type with galvanized steel hood and side panels, 8 statically balanced steel blades, bolt together side panels, and adjustable motor mount for ease of belt tensioning, preassembled top including birdscreen hinges to side panels. Units shall be watertight when fully assembled with latch locks, disconnect switch (non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit), motorized dampers, and curbs. Dampers shall be parallel-blade dampers mounted in curb base with electric actuator, wired to close when fan stops. Curbs shall be galvanized steel, mitered and welded corners 1½" thick, rigid, fiberglass insulation adhered to inside walls, and sized as required to suit opening and fan base. Unit shall be 36" axial belt drive exhaust/supply ventilator, 1½ hp, 765 RPM, totally enclosed 3-phase electrically reversible motor, drip-proof capacitor start motor, 440 volts, 60 Hz, and capable of 9,450 cfm minimum air delivery at 0.375 inch SP. Units shall be

suitable for hazardous locations. Gravity ventilator shall be the same as hood and appurtenances as the powered ventilator with the only difference being the absence of the motor. Gravity unit shall be readily capable of incorporating a motor if needed in the future. Air ducts shall be stainless steel with a duct liner and the necessary hangers and supports. Sheet metal shall be stainless steel (ASTM A 480/A 480M, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view and type 304 sheet form with No. 1 finish for concealed ducts) and shall have tie rods (stainless steel, type 304, ¼" minimum diameter for 36" length or less; ³/8" minimum diameter for lengths longer than 36"). The duct liner shall comply with NFPA 90A or NFPA 90B and NAIMA's "Fibrous Glass Duct Liner Standard". The duct material shall be 1" thick ASTM C 1071 with coated surface exposed to air stream to prevent erosion of glass fibers and shall comply with fire hazard classification of duct liner systems. The hangers and supports shall be used as necessary to securely fasten the duct to the adjacent wall and/or ceiling.

2-12 MORTAR

- A. Type S mortar shall be 1 part Portland cement, 1/2 part hydrated lime or lime putty and 3 parts sand or 1/2 part Portland cement, 1 part masonry cement and 2-3/4 parts sand.
- C. Fine grout shall be one part Portland cement, 1/10 part hydrated lime or lime putty, and three pars sand, or one part masonry and 2 3/4 parts sand.

PART 3 - EXECUTION

3-01 GENERAL

- A. The Contractor shall complete final assembly of equipment and accessories necessary for proper functioning of such equipment.
- B. The Contractor shall furnish shop drawings and manufacturer's catalog sheets for all pump station materials and systems.
- 3-02 ASSEMBLY: The Contractor shall complete final assembly of equipment delivered to the job site unassembled. Included in the work shall be the interconnection of equipment with electric wiring and piping, as required for an operable installation.

3-03 EQUIPMENT SETTING

- A. All equipment shall be set plumb, level and true in elevation, alignment and dimensions. The Contractor shall check all dimensions necessary for installation of equipment and be responsible for the correctness and proper fitting of his work.
- B. Upon completion of equipment installation, the Contractor shall thoroughly clean all lubrication reservoirs and install lubricants recommended by the manufacturer at no extra cost to the Owner.

3-04 MECHANICAL

A. A thorough visual inspection will be made of all piping, valves, fittings, brackets, mountings, seals, conduit, painting, sheaves, belt guards, sleeves, gauges, welds, clips, overall appearance, etc. This visual inspection will be conducted while all components are being tested to ensure proper field performance.

3-05 START-UP SERVICE

A. The Contractor will provide the services of a factory trained representative for the maximum period of three (3) days to perform the initial start up of the pumping station and to instruct the Owner's operating personnel in the operation and maintenance of the pumping station at no extra cost to the Owner.

3-06 CLEAN-UP AND RESTORATION OF SITE

- A. After the work has been completed, the Contractor will dispose of all surplus materials, dirt and rubbish from the site. Surplus dirt will be disposed of or deposited at the locations and in the manner approved by the Engineer.
- B. The Contractor will further remove all tools and other equipment used by him thereby leaving the site free, clear and in good condition.
- C. Performance of the work described herein will not be paid for separately but will be considered as a subsidiary obligation of the Contractor.

3-07 GUARANTEE

- A. In addition to the Contractor's one (1) year guarantee, the manufacturer of the pumping station will guarantee for one (1) full year from the date of acceptance by the Owner that all equipment will be free from defects in design, material and workmanship. Whether of his own manufacture or not, the Contractor will furnish replacement parts of any component which is proved defective during the guarantee period.
- B. The manufacturer will not be required to replace items which are normally consumed in service such as light bulbs, oil, grease and packing and other incidentals.

3-08 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.
- B. Installation of sheeting and shoring shall be the responsibility of the Contractor. Shoring left in place by the Contractor shall not entitle the Contractor to any claim for extra compensation.

DIVISION 15 - MECHANICAL

SECTION 15351

EFFLUENT PUMPS

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SECTION 15351

EFFLUENT PUMPS

PART 1 - GENERAL

1-01 DESCRIPTION

- A. Furnish all labor, materials, equipment and incidentals required and install, place in operation and field test two (2) 20" vertical water lubricated propeller pumps and motors as hereinafter specified. These pumps shall be located on the Post Aeration structure with piping as detailed on the plans. Each unit shall include a bowl assembly, strainer, column and open lineshaft with above ground discharge head, and a drive as specified.
- B. These Specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment application. It is, however, intended to cover the furnishing, the shop testing, the delivery and complete installation and field testing, of all materials, equipment and all appurtenances for the complete pumping units as herein specified, whether specifically mentioned in these Specifications or not.
- C. The Contractor shall be required to furnish all equipment, materials, labor and tools incidental to the work; perform all excavation, trenching, dewatering, sheeting, shoring, bracing and backfilling; connect and test all electrical and mechanical work; and complete the installation ready for use.
- D. Wherever Contractor's work borders, connects to or affects work by other Contractors or contracts, Contractor shall coordinate his work to minimize inconvenience to the total job effort. Where others construct the force main from the pump station and are required to "prove" same by pigging, Contractor shall have his personnel present to operate the pumps during the pigging operation, at no additional cost.

1-02 SUBMITTALS

- A. The Contractor shall submit to the Contracting Officer shop drawings and manufacturer's catalog sheets on all equipment, piping, electrical, and mechanical work prior to initiating any work on same. Six (6) copies of the submittals should be transmitted, bound in durable binders.
- B. The Contractor shall submit shop drawings of other items when requested by the Contracting Officer.
- C. The sewage pumps shall be factory tested prior to incorporation into the work. Manufacturer's certifications of pump flow and head delivery and rating curves shall be submitted in duplicate to the Contracting Officer for review.

- D. Copies of all materials required to establish compliance with the specifications shall be submitted in accordance with the provisions of the General Conditions and Division 1. Submittals shall include at least the following:
 - 1. Certified shop and erection drawings showing all-important details of construction, dimensions and anchor bolt locations.
 - 2. Descriptive literature, bulletins, and/or catalogs of the equipment.
 - 3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, efficiency, NPSHR, and horsepower. Curves shall be submitted on 8-1/2-inch by 11-inch sheets; at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to pump capacity at minimum specified total head. Catalog sheets showing a family of curves will not be acceptable. Curves shall be plotted for both minimum and maximum speed. The minimum head system curve shall also be plotted on the submittal.
 - 4. Complete master wiring diagrams, elementary or control schematics, including coordination with other electrical control devices such as the Effluent Pump Control System and suitable outline drawings shall be furnished for approval before proceeding with manufacture. Provide suitable outline drawings showing such details as are necessary to locate conduit stub-ups and field wiring. Due to the complexity of the system, it is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard preprinted sheets or drawings simply marked to indicate applicability to this contract will not be acceptable. Refer to the Electrical and Instrumentation Drawings for the control-wiring diagram of the pump motors.
 - 5. The total weight of the equipment including the weight of the single largest item.
 - 6. A complete total bill of materials of all equipment.
 - 7. A list of the manufacturer's recommended spare parts to be supplied with the manufacturer's current price for each item. Include gaskets, packing, etc., on the list. List bearings by the bearing manufacturer's numbers only.
 - 8. Complete motor data.
 - 9. Copies of all factory test results.

E. Design Data

1. Complete motor performance data shall be furnished.

2. A torsional mass elastic system analysis for each complete pumping assembly, with a statement to the effect that the system analysis indicates full compliance with the requirements of this section.

F. Test Reports

- 1. A schedule of the date of shop testing and delivery of the equipment to the job site.
- 2. Description of pump factory test procedures and equipment.
- 3. Copies of all test results, as specified in Part 3 of this Section.

G. Operation and Maintenance Data

- 1. Complete operating and maintenance instructions shall be furnished for all equipment included under these specifications. The maintenance instructions shall include troubleshooting data and full preventative maintenance schedules, and complete spare parts lists with ordering information.
- 2. In the event that it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all non-conforming aspects.
- 3. The submittal format shall be in the form of a booklet; suitably tabbed and divided to cover all areas noted in paragraphs above. The submittal booklet shall include adequate detail and sufficient information for the Contracting Officer to determine that all of the equipment proposed meets the detailed requirements of the Specifications.

1-03 APPLICABLE CODES

- A. All pressure piping shall be completed in accordance with ASME requirements, where applicable.
- B. All electrical work shall conform to NEC requirements, where applicable.
- C. Any other City, County or State Codes in force in the area of the work.

1-04 STATION DESCRIPTION

- A. Pumping Station shall consist of a duplex identical pump arrangement with provisions for a third pump to be added at a future date.
- B. In accordance with the requirements of this Section and the Contract Plans, the Contractor shall construct post aeration structure/concrete wetwell, and furnish and install two (2) each vertical water lubricated propeller pumps. The pumps shall be designed to pump wastewater treatment facility effluent.

C. The Contractor shall furnish and install an automatic control system, all piping and valves, to provide a complete operable system. The Contractor shall also be required to furnish all equipment, materials, labor and tools incidental to the work; perform all excavation, trenching, dewatering, sheeting, shoring, bracing, and backfilling; connect and test all electrical and mechanical work; and complete the installation ready for use by the Owner.

1-05 PUMP MANUFACTURER QUALIFICATIONS

- A. To assure unity of responsibility, the pumps and motors shall be coordinated by the pump manufacturer. The Contractor shall assume full responsibility for the satisfactory installation and operation of the entire pumping systems including pumps, motors, and controls as specified.
- B. The equipment covered by these Specifications is intended to be standard units of proven ability as manufactured by a competent organization having long experience in the production of such equipment. A single manufacturer shall furnish units specified herein. The pumps furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed. Pumps shall be manufactured in accordance with the Hydraulic Institute Standards, except where otherwise specified herein.
- C. All equipment furnished under this Specification shall be new and unused and shall be the standard product of manufacturers having a successful record of manufacturing vertical turbine solid handling pumps and servicing the equipment and systems specified herein for a minimum of five (5) years and 100 units.
- D. The pump manufacturer shall be fully responsible for the design, arrangement, and operation of all connected rotating components of the assembled pumping unit to ensure that neither harmful nor damaging vibrations occur at any speed within the specified operating range. Design shall include all supporting sole plates and fabricated steel base plate for mounting the units.

1-06 OPERATING INSTRUCTIONS

- A. Six (6) sets of operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment.
- B. A factory representative of all major component manufacturers, who has complete knowledge of proper operation and maintenance, shall be provided for two (2) days to instruct representatives of the Owner and the Contracting Officer on proper operation and maintenance. With the Owner's permission, this work may be conducted in conjunction with the inspection of the installation and test run as provided under PART 3. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

1-07 TOOLS AND SPARE PARTS

- A. One (1) set of all special tools required for normal operation and maintenance shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.
- B. The pump manufacturer shall furnish the spare parts for each component of the pumping systems. The manufacturer shall furnish a complete list of recommended spare parts necessary for the first five (5) years of operation of the pumping system.
- C. Spare Parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long term storage.

1-08 PRODUCT HANDLING

- A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.
- B. All equipment and parts must be properly protected against any damage during a prolonged storage period at the site.
- C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Contracting Officer.
- D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks strongly built and securely bolted thereto.
- E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
- F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.
- G. Each box or package shall be properly marked to show its net weight in addition to its contents.

1-09 WARRANTY

- A. The Contractor and the pump manufacturer shall warrant all equipment supplied under this section for a period of one (1) year. Warranty period shall commence on the date of Owner acceptance, as outlined in the Contract Documents.
- B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the Owner.

C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision shall be allowed.

PART 2 - MATERIALS

- 2-01 SOURCE OF MATERIALS AND EQUIPMENT: The Contractor will furnish only approved products of domestic manufacture for incorporation into the permanent work. This requirement shall not be interpreted to permit any manufacturer's warranty to operate in lieu of the Contractor's warranty.
- 2-02 OPERATING CONDITIONS: Each pump shall be capable of delivering the required volume of wastewater treatment facility effluent against the specified total dynamic head set forth herein below or on the Construction drawings. All openings and passages shall be large enough to permit the passage of a sphere three and a quarter inches (3¼") in diameter and any trash or stringy material which can pass through a four inch (4") diameter house collection system.

2-03 PUMPS

- A. GENERAL: Pumps shall be of the vertical water lubricated propeller type. The pumps shall be clockwise rotation and connect to the discharge piping and shall be suitable for exposure to weather.
- B. PERFORMANCE: Each pump must have the necessary characteristics and be properly selected to perform under the following operating conditions:

Characteristic	Simplex	Duplex	Future Triplex
1. Capacity	7,000 gpm	14,000 gpm (total)	21,000 gpm (total)
2. Total Dynamic Head	25 ft	27 ft	30 ft
3. Maximum Speed	705 rpm	705 rpm	705 rpm
4. Efficiency (min. hydraulic)	80%	75%	75%
5. Min. Spherical Solid Size	3¼ in	3¼ in	3¼ in

- C. The pumping units required under this section shall be complete including suction barrels and pumps with proper alignment and balancing of the individual units. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustment shall be provided.
- D. All necessary anchor bolts, nuts and washers shall be furnished by the pump manufacturer for installation by the Contractor. Anchor bolts, nuts and washers shall be 316 stainless steel. A molybdenum disulfide anti-seize agent shall be supplied for use with all stainless steel bolts.
- E. Stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed and all other pertinent data shall be attached to each pump, motor variable frequency drive and control panel.

F. The pumps shall be built to standard dimensions such that parts will be interchangeable between like units and the same manufacturer shall supply all units.

G. Certified Factory Tests:

- 1. Factory testing in accordance with the standards of the Hydraulic Institute shall be required for all pumps.
- 2. Certified pump performance curves shall be submitted, including head, capacity, brake horsepower, and pump efficiency for each pump supplied. Certified data shall be provided to indicate the NPSH required by the pumps when operating at full speed at the minimum head system conditions.
- 3. In lieu of testing with job equipment, pumps may be tested with a laboratory column pipe and discharge head similar in size to that furnished for final installation.
- 4. All pumps shall be tested at full speed and complete staging through the specified range of conditions, and head/capacity/efficiency curves plotted. During each test, the pump shall be run at each head condition for sufficient time to accurately determine discharge, head, power input, and efficiency. Pump efficiency as defined herein will include all head losses from the bowl assembly entrance, bowl assembly, pump column, and discharge head.
- 5. If any pump tested fails to meet any specification requirement it will be modified until it meets all specification requirements. If any pump tested fails to meet the efficiency requirements at any of the listed flow or head conditions listed in 2-03, B and all reasonable attempts to correct the inefficiency are unsuccessful, the pump(s) shall be replaced with unit(s) which meet the specified requirements.

H. PUMP CONSTRUCTION

- 1. The connection of the output shaft of the motor to the head shaft shall be made with an adjustable flanged coupling. Impeller adjustments shall be made through the adjustable flanged coupling.
- 2. The pump shall be furnished with a suitable, integral fabricated ASTM A-36 steel mounting ring of adequate design with registered fit to match the mounting dimensions of the drive motor.
- 3. The discharge head shall be fabricated steel construction of ASTM A-36 steel, 3/8-inch minimum thickness and of the above base type and shall be not less than 20 inches nominal diameter with a 20 inch, 150 lb. flat faced flanged discharge connection conforming, dimensionally, to ANSI/AWWA A21.15/C115. The packing gland access openings shall be of adequate size to allow for packing adjustment and replacement and shall be protected by expanded metal screens constructed of 316 stainless steel.

- 4. Incorporated in the fabrication of the discharge head shall be a suitable pump support base not less than 1- inch in thickness, with 44"x 44" dimensions minimum to support both the pump and the motor.
- 5. The Discharge Bowl shall be provided with a bearing immediately above the Propeller and a Connector Bearing above the seven diffuser vanes. A Discharge Bowl Bearing by-pass shall be provided in the bearing cavity for drainage and pressure relief. The Connector Bearing shall be externally threaded along its entire length. The first stage propeller seal surface shall be in the Intermediate Bowl.
- 6. A 1¹⁵/₁₆" diameter Pump Shaft, designed to transmit the drive torque, is required. The Propellers shall be attached to the Pump Shaft by use of longitudinal keyways and annular keyways fitted with Snap Rings to prevent axial movement.
- 7. The pump column shall be constructed of ASTM A-36 steel, not less than 20 inches in diameter and not less than Schedule 20, flanged at each end. Column pipe shall be furnished in lengths of not over ten (10) feet, and shall be connected by flanged joints registered to ensure proper alignment after assembly. Column shall be flanged, size 20", with rabbet fits to assure proper alignment and weighing a minimum of 52.73 lbs./ft. Maximum flange O.D. shall not exceed 24¼". Bearing Retainer shall be fabricated steel, welded inside the column pipe and machined to accept Non-Revolvable Rubber Bearings.
- 8. The Lineshaft shall be of open design, 1¹⁵/₁₆" minimum diameter, size per ANSI-B 58.1 to provide satisfactory operation without undue vibration or distortion, and furnished in sections of uniform length not exceeding 10 feet. Bearings shall be lubricated by the pumped fluid. The Lineshaft shall be coupled with threaded steel Shaft Couplings machined from solid bar stock. A replaceable Lineshaft Sleeve having a maximum O.D. of 3" shall be supplied at each lineshaft bearing journal.
- 9. The line shaft couplings shall be of the threaded type constructed of ASTM A-276 416 Stainless Steel Alloy and of such design that no threaded parts, which could cause "galling", are interconnected. Alternate constructions must be of a design acceptable to the Contracting Officer.
- 10. Propellers of the axial flow 4-vane design, capable of passing a 3¼" solid, shall be supplied. Vane leading edges shall be rounded to prevent accumulation of fibrous material. Propellers shall be statically and dynamically balanced to limit vibration and supported on sides by bearings for stability.
- 11. The pump bowls shall be constructed of ASTM A-48 Class 30 cast iron having a minimum tensile strength of 30,000 psi. The pump bowls shall be of sufficient thickness to withstand stresses and strains at full operating pressure. The bowls shall be subjected to a hydrostatic test 150 percent of shutoff pressure. The bowls shall be designed and manufactured with open and smooth water passages

- to assure efficient, reliable operation. Pump Bowls shall be flanged, and free from sand and blow holes.
- 12. The suction bell shall be free of bearing hubs and supporting ribs or vanes to allow unobstructed flow to the impeller and fitted with wearing ring which shall be of ASTM A743 CA15 material with a hardness range of 300-350-Brinell. The Suction Bell shall be of the flared inlet type with a grease packed lower bearing. It shall be provided with three guide vanes designed to minimize entrance losses and reduce vortexing. A Sand Cap shall be provided to prevent entrance of sand into the Suction Bell Bearing.
- 13. Pump Coating: All portions of the column and pump discharge head not exposed to view, except for the interior of the bowls, shall have an interior and an exterior coating of high build modified epoxy of 6 to 8 mils dry thickness, compatible with the pump service. Surface preparation shall be in accordance with the coating manufacturer's recommendations.
- 14. An Open Lineshaft Packing Box rated for a minimum working pressure of 175 PSI, and suitable for a 1¹⁵/₁₆" diameter shaft, and a 3" O.D. sleeve, shall be supplied. Packing Box depth shall be 1⁵/₈" minimum and shall be provided with 4 rings of ³/₈" square Packing. A Packing Box Bushing, arranged for grease lubrication of the Packing, shall be supplied. A Packing Gland shall be provided to compress the Packing by use of two ¹/₄" diameter Gland Studs. A Shaft Slinger shall be furnished to prevent pumped fluid from traveling up the shaft into the driver.

I. SPARE PARTS

- 1. Three (3) sets of packing.
- 2. One (1) complete set of gaskets required for each pump provided.
- 3. Two (2) sets of line shaft bearings for each pump provided.
- 4. One (1) set of shaft sleeve.
- 5. One (1) set of wear rings, stationary and rotating.

2-04 MOTORS

A. General

- 1. The motors for the pumps shall be squirrel cage induction type. Motor frames shall be of the VSS, WP-I design, with a max. Temperature rise of 60 degree C over a 40 degree C ambient. Motors shall incorporate a non-reverse ratchet.
- 2. Motors must be designed to accept all up thrust loads imposed by pump during starting and running.

- 3. All motors shall be built in accordance with latest NEMA, IEEE, ANDI and AFBMA standards where applicable.
- 4. Motors shall conform to all requirements stipulated in PART 1 GENERAL of this Section of the Specifications.
- 5. The motors shall be compatible with the pumps.
- B. System Power Requirements: Electrical power furnished to the site will be 480 volt, 3 phase.

2-05 VALVES

- A. Check valves in the pump station, 10 inches and smaller, shall be resilient seated, AWWA approved, 150 psi working pressure, with external spring and lever for exposed installation with connections as indicated on the Drawings.
- B. Gate valves shall comply with the latest edition of AWWA C-509. Gate valves shall be iron body, encapsulated high strength cast iron wedge, resilient seat, non-rising stem, and shall open counterclockwise. All gate valves shall have a maximum working pressure of 200 PSI and be tested at 400 PSI. The thrust collar and other bearing surfaces shall be permanently lubricated with oil. Gate valves shall be equipped with flanged joint connections unless otherwise specified.
- C. Pressure air release valves for the pump discharge shall have a cast iron ASTM A48 Class 30 body and cover, with stainless steel linkage, Buna-N valve, stainless steel seat and float.

PART 3 - EXECUTION

3-01 GENERAL

- A. The Contractor shall complete final assembly of equipment and accessories necessary for proper functioning of such equipment.
- B. The Contractor shall furnish shop drawings and manufacturer's catalog sheets for all pump station materials and systems.
- 3-02 ASSEMBLY: The Contractor shall complete final assembly of equipment delivered to the job site unassembled. Included in the work shall be the interconnection of equipment with electric wiring and piping, as required for an operable installation.

3-03 EQUIPMENT SETTING

A. All equipment shall be set plumb, level and true in elevation, alignment and dimensions. The Contractor shall check all dimensions necessary for installation of equipment and be responsible for the correctness and proper fitting of his work.

B. Upon completion of equipment installation, the Contractor shall thoroughly clean all lubrication reservoirs and install lubricants recommended by the manufacturer at no extra cost to the Owner.

3-04 MECHANICAL

A. A thorough visual inspection will be made of all piping, valves, fittings, brackets, mountings, seals, conduit, painting, sheaves, belt guards, sleeves, gauges, welds, clips, overall appearance, etc. This visual inspection will be conducted while all components are being tested to ensure proper field performance.

3-05 FIELD WIRING

- A. The Contractor will be responsible for contacting the electrical utility company and securing power to the site for operation of the pumping station. The Contractor will be required to pay all power usage charges and demand charges incurred by his operations until final acceptance of the Project.
- B. The Contractor will furnish and install a round creosote treated service pole at the location designated on the Construction Drawings. The contractor will also furnish and install on the service pole the weatherhead entrance, the meter base, the master disconnect and the pump control panel, if so indicated by the plans.

3-06 POWER SERVICE

A. The service pole will have a minimum height of twenty (20) feet projected from ground line with sufficient bury to rigidly secure the installation. The service pole shall have a minimum diameter of eight (8) inches. The meter base and weatherhead entrance shall be of the type and quality approved by the local power company.

3-07 START-UP SERVICE

A. The Contractor will provide the services of a factory trained representative for the maximum period of one (1) day to perform the initial start up of the pumping station and to instruct operating personnel in the operation and maintenance of the pumping station at no extra cost to the Government.

3-08 CLEAN-UP AND RESTORATION OF SITE

A. After the work has been completed, the Contractor will dispose of all surplus materials, dirt and rubbish from the site. Surplus dirt will be disposed of or deposited at the locations and in the manner approved by the Contracting Officer.

- B. The Contractor will further remove all tools and other equipment used by him thereby leaving the site free, clear and in good condition.
- C. Performance of the work described herein will not be paid for separately but will be considered as a subsidiary obligation of the Contractor

3-09 GUARANTEE

- A. In addition to the Contractor's one (1) year guarantee, the manufacturer of the pumping station will guarantee for one (1) full year from the date of acceptance, that the structure and all equipment will be free from defects in design, material and workmanship. Whether of his own manufacture or not, the Contractor will furnish replacement parts of any component which is proved defective during the guarantee period.
- B. The manufacturer will not be required to replace items which are normally consumed in service such as light bulbs, oil, grease and packing and other incidentals.

3-10 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.
- B. Installation of sheeting and shoring shall be the responsibility of the Contractor. Shoring left in place by the Contractor shall not entitle the Contractor to any claim for extra compensation.

DIVISION 15 - MECHANICAL

SECTION 15352

SCUM PUMPING STATION

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PART 4 - COMPENSATION

SECTION 15352

SCUM PUMPING STATION

PART 1 - GENERAL

1-01 DESCRIPTION

- A. General: In accordance with the requirements of these Technical Specifications, the Contractor shall furnish and install the pumping stations of the types specified on the Drawings and at the locations designated.
- B. The Contractor shall be required to furnish all equipment, materials, labor and tools incidental to the work; perform all excavation, trenching, dewatering, sheeting, shoring, bracing and backfilling; connect and test all electrical and mechanical work; and complete the installation ready for use.
- C. Wherever Contractor's work borders, connects to or affects work by other Contractors or contracts, Contractor shall coordinate his work to minimize inconvenience to the total job effort. Where others construct the force main from the pump station and are required to "prove" same by pigging, Contractor shall have his personnel present to operate the pumps during the pigging operation, at no additional cost.

1-02 SUBMITTALS

- A. The Contractor shall submit to the Contracting Officer shop drawings and manufacturer's catalog sheets on all equipment, piping, electrical, and mechanical work prior to initiating any work on same. Six (6) copies of the submittals should be transmitted, bound in durable binders.
- B. The Contractor shall submit shop drawings of other items when requested by the Contracting Officer.
- C. The sewage pumps shall be factory tested prior to incorporation into the work. Manufacturer's certifications of pump flow and head delivery and rating curves shall be submitted in duplicate to the Contracting Officer for review.

1-03 APPLICABLE CODES

- A. All pressure piping shall be completed in accordance with ASME requirements, where applicable.
- B. All electrical work shall conform to NEC requirements, where applicable.
- C. Any other City, County or State Codes in force in the area of the work.

1-04 STATION DESCRIPTION

- A. Pumping Station shall consist of a duplex identical pump arrangement with each pump providing the design peak capacity.
- B. In accordance with the requirements of this Section, the Contractor will furnish and install a precast wetwell with close coupled built together sewage pumps. The pumps shall be designed to operate submerged. The pump motors and flexible power conduits will be constructed absolutely watertight.
- C. The Contractor shall furnish and install an automatic control system, all piping and valves, and a rail system to provide a complete operable system. The Contractor shall also be required to furnish all equipment, materials, labor and tools incidental to the work; perform all excavation, trenching, dewatering, sheeting, shoring, bracing, and backfilling; connect and test all electrical and mechanical work; and complete the installation(s) ready for use by the Owner.

PART 2 - MATERIALS

- 2-01 SOURCE OF MATERIALS AND EQUIPMENT: The Contractor will furnish only approved products of domestic manufacture for incorporation into the permanent work. This requirement shall not be interpreted to permit any manufacturer's warranty to operate in lieu of the Contractor's warranty.
- 2-02 OPERATING CONDITIONS: Each pump shall be capable of delivering the required volume of raw unscreened sewage against the specified total dynamic head set forth herein below or on the Construction drawings. All openings and passages shall be large enough to permit the passage of a sphere two and a half inches (2.5") in diameter and any trash or stringy material that can pass through a four-inch (4") diameter house collection system.

2-03 PUMPS

- A. GENERAL: Pumps shall be of the submersible type specifically designed for the handling of raw, unscreened, sanitary domestic sewage. The pumps shall be UL Listed for explosion proof Class I, Division 1, Groups C and D hazardous locations. The pumps shall be clockwise rotation and connect to the discharge piping when lowered into place.
- B. PERFORMANCE: Each pump must have the necessary characteristics and be properly selected to perform under the operating conditions shown on the Construction Drawings.
 - 1. Clarifier Scum Pump Station conditions of operation:

i. Capacity	150 gpm
ii. Total Dynamic Head	37.5ft
iii. Maximum Speed	1,800 rpm
iv. Efficiency (min. hydraulic)	50%
v. Shutoff Head	52 ft
vi. NPSHR	8 ft
vii. Min. Spherical Solid Size	2.5 in

C. CONSTRUCTION: Each pump shall be of the sealed submersible type. Pump volute, motor and seal housing are to high quality gray cast iron. All external-mating parts shall

be machined and O-ring sealed. All fasteners exposed to the pumped liquid shall be stainless steel. Impeller is to be two-vane, enclosed, so that the impeller diameter may be trimmed to meet various specific conditions of head and capacity while still retaining factory balance. Pumps shall be capable of passing a two and a half inch (2.5") spherical solid. Case wearing ring shall be bronze to minimize impeller wear and shall be easily replaceable in the field.

- D. POWER CORD: Electrical power cord shall have an outer jacket that is resistant to oil and other materials normally found in sewage. Power cord shall be sealed with a cord grip and shall have individual conductors sealed into the cord cap assembly with epoxy sealing compound. This epoxy seal shall be repeated where the conductors enter the motor from the connection box that is mounted on top of the motor housing. The cord cap and connection box shall each be sealed with an O-ring. This shall provide a double-sealed, watertight power cord entry through which liquid cannot enter the motor by following individual conductors inside the insulations. All cords shall be of sufficient length to extend from the wetwell to the control panel without splicing.
- E. STATOR WINDINGS: The stator winding, rotor and bearings shall be mounted in a sealed submersible type housing. The pump and motor shall be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump shall not require cooling jackets. Dependence upon, or use of, water jackets for supplemental cooling will not be allowed. Stators shall be securely held in place with a removable end ring and threaded fasteners so that it may be easily removed in the field without the use of head or a press. Stators must be capable of being repaired or rewound by a local motor repair station. No special tools shall be required for pump and motor disassembly.
- F. MECHANICAL SEALS: The pump shall have two mechanical seals, mounted in tandem, with an oil chamber between the seals. Rotating seal faces shall be carbon and stationary seal faces shall be ceramic. The lower seal must be replaceable without disassembly of the seal chamber.

The seal chamber shall be fitted with an electric probe. A separately mounted alarm shall be supplied to indicate water in the seal chamber.

- G. PUMP MOTORS: Shall be non-overloading over the full range of the pump curve.
 - 1. The pumps for the Scum Pump Station shall be driven by completely sealed, electric submersible squirrel cage induction motors with a maximum NEMA nameplate rating of 5 HP, 1.15 service factor, 1,800 RPM, 480 volts, 3-phase, 60 Hertz. The motor nameplate horsepower rating should exceed the brake horsepower requirements of the specified head and capacity conditions and have a minimum full load efficiency of 50%.
 - 2. Submersible equipment shall be UL Listed for Class I, Division 1, Groups C and D explosion-proof hazardous locations as defined by the National Electric Code. All electrical parts shall be housed in an air-filled (or oil-filled in 210 frame construction) cast iron, watertight enclosure that is sealed by the use of O-rings and rabbeted joints with extra large overlaps.

- 3. The stator winding and lead shall be insulated with moisture-resistant Class F insulation for continuous duty in 40 degree C ambient. The motor shall be designed for continuous duty capable of ten (10) starts per hour. Automatic reset, normally closed thermal overloads shall be imbedded in the motor windings to provide overheating protection. Motor winding thermostats must be connected to an electric controller per local and state codes and the National Electric Code.
- 4. Motor shaft shall be one-piece, 416 stainless steel. Carbon steel shafts or shaft sleeves are not acceptable. Rotor is to be dynamically balanced to meet NEMA vibration limits; all external hardware is to be stainless steel.
- 5. Cable leads are to enter at the top of the motor, and are to allow the cable-to-motor connection to be accomplished in the field without soldering. All power and control lead wires are to be double sealed as it enters the motor in such a manner that cable wicking will not occur. This sealing system shall consist of a rubber grommet followed by epoxy that is high in adhesive qualities and has a low coefficient of expansion. Each cable wire is to have a small section of insulation removed to establish a window area of bare wire and each wire is to be untwisted and surrounded by epoxy potting material. A cable strain relief mechanism shall be an integral part of this sealing system. Cable sealing system shall be capable of withstanding an external pressure test of 1200 PSI as well as a cable assembly pull test as required by Underwriters Laboratories. Singular grommet or other similar sealing systems are not acceptable. Motor shall be supplied with multi-conductor type "SOW-A" or "W" power cable and control cable. Cable sizing shall conform to NEC specifications and be UL Listed
- 6. Power and control leads shall be terminated on a sealed terminal board. The terminal board and its bronze lugs shall be O-ring sealed.
- 7. Pumps shall be provided with two separate tandem-mounted mechanical seals to prevent the pumped liquid from entering the rotor/stator cavity area to ensure reliability of operation. The upper and lower seals are mounted to rotate in the same direction.
- 8. The upper seal is to be completely immersed in an oil bath and seals the oil chamber and the motor housing. The lower seal mating surfaces are to be immersed in the oil bath sealing the pump volute and the oil chamber. Each seal shall be held in contact by its own spring system and require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The lower seal spring shall be protected from trash in the pumped fluid by a spring cover that extends over the entire length of the compressed seal spring. Pressure generated by the pump assists in sealing the mating surfaces of the lower seal.
- 9. Seal materials for the upper seal shall be stainless steel and Buna-N components, carbon rotating face and Ni-resist stationary face. Lower seal construction shall be stainless steel and Buna-N components, carbon (silicon carbide on 400 & 440 frames) rotating face and ceramic (tungsten carbide on 400 & 440 frames) stationary face.

- 10. Two moisture detection probes shall be installed so that they will detect moisture in either the seal or stator cavity measuring resistivity between the probes. They shall be wired internally to the control cable connection at the top of the motor. Float type devices located in the rotor/stator area or single probe-to-ground moisture detectors measuring continuity are not acceptable. O-ring sealed inspection plugs shall be provided in the mechanical seal oil chamber for ease in inspection, draining and filling of oil.
- 11. The pump shall rotate on a grease lubricated-for-life thrust bearing (oil lubricated on 210 frame) and oil lubricated radial. Lower shaft bearings shall be locked in place to prevent shaft movement and to take thrust loads.
- 12. A heavy-duty stainless steel lifting bail shall be included and be of adequate strength to lift the entire pump and motor assembly.
- 2-04 SYSTEM POWER CHARACTERISTICS: Electrical power furnished to the site will be 480 volt, 3-phase as stated on the Contract Drawings.

2-05 ELECTRICAL CONTROL PANEL

- A. GENERAL: The control panel shall consist of a circuit breaker and magnetic starter for the pump, actuated by mercury float switches. The control assembly shall provide means to operate the pump manually or automatically.
- B. ENCLOSURE: Control panel shall have a NEMA III R, rainproof enclosure with separate removable inside base plate to mount all components. The outside door shall have provisions for locking.
- C. COMPONENTS: A circuit breaker and magnetic starter with 3-leg overload protection shall be provided for each pump. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. Starter shall have auxiliary contact to operate both pumps on override conditions. If the pump circuit breaker trips, power shall still be available, and maintained, for the control circuit. H-O-A switches and run lights shall be supplied for the pump. A terminal strip shall be provided for connecting control wires, alarm, heat sensor, and seal sensor wires. The control panel shall include a transformer, where necessary, to reduce control voltage to 115 volts. A phase failure monitor and lighting arrestors shall be included.
- D. OPERATION: Mercury tube switch level controls shall be provided to operate the system. Four level controls shall be used for automatic operation. The lower control shall be set at the cut-off level, the second control at the required cut-on level, the override control set above the second control, and the fourth control to actuate the high water alarm.
- E. ALARM: A flashing alarm light shall be furnished on the control panel. The alarm light shall flow dim at all times except under alarm conditions. The light shall then glow bright and flash.

F. ELAPSED TIME METERS: Six digit elapsed time meters (non reset type) shall be connected to each motor starter to indicate the total running time of each pump in "hours" and "tenths of hours." An elapsed time shall also be installed to indicate the total running time when the average flow pumps run simultaneously.

2-06 RAIL SYSTEM

A. GENERAL: The Contractor shall furnish and install a complete pumping station.

The pump system shall include two submersible pumps with mating arrangements, pump carrier assembly, pump mounting plates with discharge elbow and bottom rail supports, access frame with hatch covers and top rail guide supports, pump lifting chain and sealed mercury float switches.

The system shall be field installed in the concrete basin.

- B. PUMP BASE PLATE: A separate mounting plate shall be furnished for each pump. This shall include adjustable guide rail supports and pump discharge elbow to align with hydraulic sealing flange on pump discharge. Plates and fittings shall be coated with tar base epoxy. Sealing face of the discharge elbow shall be heavily coated with zinc to provide a smooth corrosion resistant surface.
- C. PUMP CARRIER: The pump carrier shall be fabricated from steel and coated with tar base epoxy. Carrier shall be mounted on each pump so that lifting is done from the carrier and no strain is placed on the pump or the guide rails. Fasteners shall be 18-8 stainless steel. Carrier shall be designed to lift from a centered loop so as to prevent binding on the guide rails. Pump weight shall not be placed on the guide rails.
- D. ACCESS HATCH: An access frame assembly shall be supplied with separate hinged cover for removal of each pump. Frame shall have upper guide rail brackets. Covers shall be provided with lifting handle, safety latch to hold cover in an open position and locking hasp. Frame and covers shall be fabricated from 1/4 inch extruded aluminum.
- E. RAILS: Rails shall be of stainless steel or FRP and sized to accommodate the pumps furnished.

2.07 VALVES

- A. Clarifier Scum Pump Station
 - 1. 4" Check Valve, 125 psi rated resilient seated type (2 each)
 - 2. 4" Fanged gate valve, 200 psi working pressure (2 each)
- B. Check valves in the pump station, 8 inches and smaller, shall be resilient seated, AWWA approved, 150 psi working pressure, with external spring and lever for exposed installation with connections as indicated on the Drawings.
- C. Gate valves shall comply with the latest edition of AWWA C-509. Gate valves shall be iron body, encapsulated high strength cast iron wedge, resilient seat, non-rising stem, and shall open counterclockwise. All gate valves shall have a maximum working

pressure of 200 PSI and be tested at 400 PSI. The thrust collar and other bearing surfaces shall be permanently lubricated with oil. Gate valves shall be equipped with mechanical joint connections unless otherwise specified.

PART 3 - EXECUTION

3-01 GENERAL

- A. The Contractor shall complete final assembly of equipment and accessories necessary for proper functioning of such equipment.
- B. The Contractor shall furnish shop drawings and manufacturer's catalog sheets for all pump station materials and systems.
- 3-02 ASSEMBLY: The Contractor shall complete final assembly of equipment delivered to the job site unassembled. Included in the work shall be the interconnection of equipment with electric wiring and piping, as required for an operable installation.

3-03 EQUIPMENT SETTING

- A. All equipment shall be set plumb, level and true in elevation, alignment and dimensions. The Contractor shall check all dimensions necessary for installation of equipment and be responsible for the correctness and proper fitting of his work.
- B. Upon completion of equipment installation, the Contractor shall thoroughly clean all lubrication reservoirs and install lubricants recommended by the manufacturer at no extra cost to the Owner.

3-04 MECHANICAL

A. A thorough visual inspection will be made of all piping, valves, fittings, brackets, mountings, seals, conduit, painting, sheaves, belt guards, sleeves, gauges, welds, clips, overall appearance, etc. This visual inspection will be conducted while all components are being tested to ensure proper field performance.

3-05 FIELD WIRING

A. The Government will be responsible for contacting the electrical utility company and securing power to the site for operation of the pumping station. The Contractor will be required to pay all power usage charges and demand charges incurred by his operations until final acceptance of the Project.

3-06 START-UP SERVICE

A. The Contractor will provide the services of a factory trained representative for the maximum period of one (1) day to perform the initial start up of the pumping station and to instruct operating personnel in the operation and maintenance of the pumping station at no extra cost to the Government.

3-07 CLEAN-UP AND RESTORATION OF SITE

- A. After the work has been completed, the Contractor will dispose of all surplus materials, dirt and rubbish from the site. Surplus dirt will be disposed of or deposited at the locations and in the manner approved by the Contracting Officer.
- B. The Contractor will further remove all tools and other equipment used by him thereby leaving the site free, clear and in good condition.
- C. Performance of the work described herein will not be paid for separately but will be considered as a subsidiary obligation of the Contractor.

3-08 GUARANTEE

- A. In addition to the Contractor's one (1) year guarantee, the manufacturer of the pumping station will guarantee for one (1) full year from the date of acceptance, that the structure and all equipment will be free from defects in design, material and workmanship. Whether of his own manufacture or not, the Contractor will furnish replacement parts of any component which is proved defective during the guarantee period.
- B. The manufacturer will not be required to replace items that are normally consumed in service such as light bulbs, oil, grease and packing and other incidentals.
- C. Pumps and motors shall be manufactured by ISO-9001 certified companies only

3-09 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave-ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.
- B. Installation of sheeting and shoring shall be the responsibility of the Contractor. Shoring left in place by the Contractor shall not entitle the Contractor to any claim for extra compensation.

PART 4 - COMPENSATION

4-01 There will be no separate measurement or payment for this item.

DIVISION 15 - MECHANICAL

SECTION 15353

SUBMERSIBLE CHOPPER PUMPS FOR DECANT PUMP STATION

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SECTION 15353

SUBMERSIBLE CHOPPER PUMPS FOR DECANT PUMP STATION

PART 1 GENERAL

1-01 DESCRIPTION

A. The Contractor shall furnish two (2) submersible wet pit chopper pumps and all appurtenances as specified. The pumps shall be specifically designed to pump waste solids at heavy consistencies without plugging or dewatering of the solids. Materials shall be chopped/macerated and conditioned by the pump as an integral part of the pumping action. The pump must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in tests and field applications.

1-02 QUALITY ASSURANCE AND PERFORMANCE AFFIDAVIT

A. The Contractor shall submit manufacturer's standard warranty and a performance affidavit for equipment to be furnished in accordance with this section. The warranty for workmanship and materials shall be manufacturer's standard for 1 year from startup, not to exceed 18 months from factory shipment. In the performance affidavit, the manufacturer must certify to the Contractor and the Contracting Officer, that the Contract Documents have been examined, and that the equipment will meet in every way the performance requirements set forth in the Contract Documents for the application specified. Shop drawings will not be reviewed prior to the receipt by the Contracting Officer of an acceptable performance affidavit. The performance affidavit must be signed by an officer of the company manufacturing the equipment, and witnessed by a notary public. The performance affidavit must include a statement that the equipment will not clog or bind on solids typically found in the application set forth.

PART 2 PRODUCTS

2-01 APPROVED MANUFACTURER

- A. Pumps shall be Model S3M as manufactured by Vaughan Co., Inc. or approved equal.
- B. It is the express intent of these specifications to accurately describe equipment that is a regular production item of the specified manufacturer, and that has a proven record of performance in identical (not just similar) applications in other treatment facilities. The chopper pump manufacturer shall have a minimum of twenty (20) years of documented experience in the design and production of chopper pumps of all types, and not less than five (5) years of experience in the production of the exact equipment as specified herein. An extensive parts inventory shall also be maintained by the manufacturer such that all parts are available for overnight delivery during the life expectancy of the pump.

2-02 SERVICE CONDITIONS

- A. The pumps specified in this section will pump Sludge Lagoon Decant using the following design flow criteria:
 - 1. 200 GPM @ 33' TDH, 5 HP, 1750 RPM.

2-03 PUMP CONSTRUCTION

- A. Casing: Shall be of semi-concentric design, with the first half of the circumference being cylindrical beginning after the pump outlet, and the remaining circumference spiraling outward to the 150 lb. flanged centerline discharge. Casing shall be A536 ductile cast iron with all water passages to be smooth, and free of blowholes and imperfections for good flow characteristics.
- B. Impeller: Shall be semi-open chopper type. Chopping/maceration of materials must be accomplished by the action of the curved, cupped and sharpened leading edges at the bottom of the impeller blades as they move across the cutter bar, creating a smooth efficient slicing effect. Pump out vanes must be provided across the entire diameter of the impeller on the backing plate, in order to reduce pressure in the seal area. The impeller shall be held in place with a key, shall have no axial adjustments or set screws, and shall not extend past the cutter bar. The impeller shall be ASTM A148 cast alloy steel and heat treated to a minimum 60 Rockwell C Hardness, and dynamically balanced.
- C. Cutter Bar: Shall be a single cast component recessed into the pump bowl, with a funnel shaped inlet opening. As a part of the casting, segment bars shall extend inwardly, to within .015" of the cutter nut. The set clearance between the cutter bar and impeller shall be adjustable to .005" to .020". The cutter bar shall be ASTM A148 cast alloy steel and heat treated to a minimum 60 Rockwell C Hardness.
- D. Upper Cutter Assembly: The impeller pump-out vanes shall be specially modified to shear against an upper cutter assembly mounted into the back side of the casing, in order to eliminate any build up of rags, hair, or other stringy material in the seal area or between the impeller and the pump casing. The upper cutter shall consist of no more than 2 cutting anvils to minimize the potential for binding. The set clearance between the impeller and upper cutter shall be adjustable to .010" or less. The upper cutter shall be ASTM 148 cast alloy steel and heat treated to a minimum 60 Rockwell C Hardness.
- E. Cutter Nut: The cutter nut shall be used to affix the impeller to the shaft, and to eliminate binding or wrapping of stringy materials at the pump inlet. The cutter nut shall consist of a hex head sufficiently sized for ease of removal, and shall include an integral cast anvil which shears against the adjacent surface of the segment bars on the cutter bar. The cutter nut shall be ASTM A148 cast alloy steel and heat treated to a minimum 60 Rockwell C Hardness.
- F. Pump Shafting: The pump shaft and impeller shall be supported by ball bearings. Shafting shall be AISI 4140 heat treated steel, with a minimum diameter of 1.5 inches in order to minimize deflection during solids chopping.

- G. Bearing Housing: Shall be A536 ductile cast iron, and machined with piloted bearing fits for concentricity of all components. Piloted motor mount shall firmly align motor on top of bearing housing.
- H. Thrust Bearings: Shaft thrust in both directions shall be taken up by two back-to-back mounted single-row angular contact ball bearings. Overhang from the centerline of the lower thrust bearing to the seal faces shall be a maximum of 1.2". A third mechanical seal shall be provided to isolate the bearings from the pumped media at operating temperatures to 250 F. The third seal, as well as the thrust bearings shall be oil bath lubricated in the bearing housing by I.S.O. Grade 46 turbine oil, with a minimum B-10 life rated 100,000 hours. Shaft overhang exceeding 1.2 inches from the center of the lowest thrust bearing to the seal faces shall be considered unacceptable.
- I. Pump Mechanical Seal: Shall be fitted with silicon carbide seal faces to provide long life expectancy in the presence of grit and abrasive solids. The seal shall ride on a 316 stainless steel shaft sleeve, with the seal tension held by 3 set screws. Seal shall be tested for flatness within 2 Helium light bands under a Helium light source and optical flat.
- J. Automatic Oil Level Monitor: An oil level switch shall be mounted at the top of the wet well, with a hose feeding down to the side of the bearing housing to detect oil level and shut off the motor in event of low oil level. A sensitive relay shall be included for mounting in the motor control panel.
- K. Shaft Coupling: The submersible motor shall be close coupled directly to the pump shaft using a solid sleeve coupling, which is keyed to both the pump and motor shafts. Slip clutches and shear pins between the shaft and the motor are considered unacceptable.
- L. Stainless Steel Nameplates: Shall be attached to the pump and drive motor giving the manufacturer's model and serial number, rated capacity, head, speed and all pertinent data.

2-04 SUBMERSIBLE ELECTRIC MOTOR

A. The submersible motor shall be U/L listed and suitable for Class I, Group D, Division I hazardous locations, rated for the service indicated, with Class B insulation system with Class F materials. Motor shall have tandem mechanical seals in oil bath and dual moisture sensing probes. The lower motor seal shall be exposed only to the lubricant in the bearing housing, with no exposure to the pumpage. Motor shall include two normally closed automatic resetting thermostats connected in series and imbedded in adjoining phases. Motor frame shall be cast iron, and all hardware and shaft shall be stainless steel.

2-05 GUIDE RAIL SYSTEM

A. Provide a guide rail system consisting of two stainless steel guide rails per pump supplied, cast ductile iron pump guide bracket and discharge elbow with mounting feet and 125 lb. flanges, an upper guide rail mounting bracket and intermediate guide brackets every 10 feet.

2-06 SURFACE PREPARATION

A. SSPC-SP5 commercial sandblast, primed and finish coated with stainless steel pigmented epoxy.

DIVISION 15 - MECHANICAL

SECTION 15381

MECHANICAL BAR SCREEN

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SECTION 15381

MECHANICAL BAR SCREEN

PART 1 - GENERAL

1-01 SUMMARY

- A. Section includes: Mechanically cleaned bar screens
 - 1. Type: Mechanical bar screen includes:
 - a. Pin rack and involute gear unit as manufactured by ONEDO Degremont Inc. of Richmond, Virginia or approved equal.
 - b. Each unit shall be installed in concrete channels by the Contractor as specified herein/or shown on the contract drawings.
- B. Related Sections; Section(s) related to this section include:
 - 1. Section 03100 Concrete Formwork
 - 2. Section 03200 Concrete Reinforcement
 - 3. Section 03300 Cast in Place Concrete
 - 4. Section 09900 Painting

1-02 REFERENCES

- A. General: Standard listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. American Society for Testing and Materials (ASTM)
- C. Occupational Safety and Health Act (OSHA)
- D. American Society of Mechanical Contracting Officers (ASME)
- E. American Institute of Steel Construction (AISC)
- F. American Welding Society (AWS)
- G. National Electrical Code, Electrical component listings by Underwriters Laboratories (UL)

1-03 SYSTEM DESCRIPTION

- A. Bar screen equipment shall be designed to remove debris from channel flow by means of a bar screen to retain debris and a traveling rake to positively clean the bar screen and elevate debris that has been retained. The bar screen shall be cleaned by a single rake engaging the bar screen from the front (upstream side) at the channel bottom and removing debris on its upward travel. There shall be no moving parts permanently mounted below the top of the channel.
- B. Each bar screen system shall consist of side frames, pin racks, involute drive gears, rake assembly with guide rollers, wiper arms, drive components, bar rack, discharge apron, deadplates (if required), local control panel, and all other components necessary for a complete and operable system.
- C. The mechanical bar screen shall discharge to a screenings press.

1-04 DESIGN REQUIREMENTS

A. General:

- 1. Bar screens employing back-cleaned design, belt-drives, chains (moving or stationary), cables, multiple motors, chain sprockets, chain components or gear plates shall not be used.
- 2. All electrical components shall be rated for a Class I, Division II, Group D location as defined by the National Electric Code.
- 3. The bar screen shall be designed for a hydraulic head differential of 4 feet.
- 4. Size parts of the mechanisms for stresses that occur during fabrication, erection, and operation. Duplicate parts shall be interchangeable.
- 5. The geometry of the bar screens shall conform to the following:

a.	Clear channel width	4'-0"
b.	Channel depth	5'-0"
c.	Channel invert to operating floor	5'-0"
d.	Maximum water depth	4'-0"
e.	Discharge height above operating floor	3'-0"
f.	Clear spacing between bars	1/4 "
g.	Bar size	5/16x3/16x2 ½"
h.	Angle of inclination from horizontal	80°
i.	Rake speed	20 fpm
j.	Minimum rake Lifting Capacity per Cyc	le 300 lbs

B. Operation:

- 1. Bypassing of obstructions: Design mechanism so that the rake can climb over and be free of an encountered object that cannot be removed.
 - a. Size: Bypass objects that have a maximum dimension of 4.5-inches from the face of the screen.
 - b. After the object has been by-passed, the rake shall again mesh with and continue to clean the screen.
 - c. Overload protection against an object too large to be bypassed shall be provided by mounting the drive on a rotating support.
 - d. Mechanisms employing shear pins, or spring-loaded rake arms, for overload protection are not acceptable.
- 2. Overload protection: Provide positive protection against an object which is too large to be bypassed.
 - a. Mount motor on a rotating support that is held in position by the linkage and spring assembly.
 - b. When the force on the rake carriage mechanism is increased beyond a predetermined value, the motor shall impart a torque to the rake arm to force the rake and rake arm to rotate away from the bar rack.
 - c. Excessive rotation of rake arm shall cause a proximity switch to stop the motor. The carriage will then automatically reverse to the top of the machine and sound an alarm. When the overload condition has been corrected, the drive may be again operated by manual push button activation.
 - d. Mechanisms that do not incorporate the pivot arrangement specified are not acceptable.
- 3. Reversing direction of travel: Provide a spring-loaded switch, locally mounted, to allow reversal of the rake assembly by manual operation at the bar screen. The mechanism shall be able to be reversed completely out of the channel. Limit travel of the mechanism in the reverse direction by use of a proximity switch to prevent damage to the wiper mechanism.
- 4. Except for emergency conditions, the motor drive shall operate only in the forward mode during the entire cleaning cycle. The use of a reversing drive motor during normal operation is not acceptable.

1-05 SUBMITTALS

A. General: Submit listed submittals in accordance with Section 01330 contained herein.

- B. Product Data: Submit product data, including Manufacturer's data, for specified products.
 - 1. System Description: Include system description with the following:
 - a. Manufacturer's data, order sheet, or equivalent for each major piece of equipment, component, instrument or device being supplied.
 - b. Manufacturer's outline and mounting dimensions for all field mounted devices, including, but not limited to, drives, motors, pumps, valves and pneumatic operators, instrumentation and controls, including control panels (if required).
 - c. Manufacturer's wiring diagrams for instrumentation and control system, including necessary field connections (if required).
 - d. Manufacturer's Dimensions and Field Fabrication Details for all mechanical equipment
 - e. Mounting details, color selection and scaled layout drawings for control panels (if required), equipment, valves and operators, piping, and instruments.
 - f. The Manufacturer shall clearly identify any exception to the specification or drawings. Failure to do this shall be grounds for rejection of the submittal.
 - g. All equipment to be furnished under this Section must be approved prior to being released for manufacturing unless otherwise noted by the Contracting Officer.
 - h. Instrument and control panel layout to scale and dimensioned, with overall size, mounting and field entries dimensioned.
 - 2. After submittal approval, but prior to delivery of equipment, Contractor shall provide to the Contracting Officer six (6) copies of an Operations and Maintenance Manual for the equipment. The manual shall contain all detailed care, use and maintenance instructions for the Owner.

1-06 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The manufacturer of the bar screen equipment shall have successful operating installations of a similar type and size to the equipment specified herein at 20 or more separate facilities. At least five of these installations shall have been operated successfully for the past 10 years in municipal wastewater treatment.

1-07 DELIVERY, STORAGE, AND HANDLING

A. The bar screen shall be factory assembled and tested before shipment by running the screen mechanism to ensure proper operation of the mechanism. The bar screen shall be constructed and shipped in the minimum practical number of pieces to the job site.

1-08 MAINTENANCE

- A. Provide Spare Equipment as follows (all parts to include associated mounting hardware):
 - 1. 2 Limit switches (of each type furnished with equipment)
 - 2. 2 Wiper blades
 - 3. 50 rollers and bushings for pin rack

Spare parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long term storage in a humid environment.

B. Special Tools

- 1. Furnish one set of all special tools required for normal operation and maintenance of the equipment.
- 2. Tools shall be furnished in a suitable steel case, clearly and indelibly marked on the exterior to indicate the equipment for which the tools were intended.
- C. Furnish a one-year supply of lubricants. Lubricants shall include summer and winter grades along with alternate references to equal products of other manufacturers including specifications such as AGMA numbers, viscosity, etc.

1-09 WARRANTY

The Bar Screen shall conform to the description contained within this specification and be free from defects in material and workmanship for a period of one (1) year.

PART 2 - PRODUCTS

2-01 MANUFACTURERS

- A. Manufacturer shall be the following:
 - 1. ONEDO Degremont, Inc. Richmond, VA, Model I or approved equal.
- B. Basis of Design.

The design has been based upon the Model I Climber Screen® Mechanical Bar Screen by ONEDO Degremont, Inc. Any costs associated for review of alternate equipment, or changes required for installation, shall be borne by the CONTRACTOR.

2-02 BAR SCREEN COMPONENTS

A. Bar Rack:

- 1. Bars: Type 304 stainless steel fastened to structural supports at top and bottom.
- 2. Maximum unsupported length: Not to exceed 4 feet 0 inches.
- 3. Span: Full width of channel. Bolt firmly to channel floor and to the concrete channel walls.
- 4. Bar Racks mounted to the Side Frames are not permissible.
- 5. The bar rack shall extend the full depth of the channel.

B. Discharge Apron:

- 1. Fabricated from 10 gauge Type 304 stainless steel suitably reinforced.
- 2. Design discharge apron with a skirt to enclose the sides of the apron.
- 3. The discharge apron shall extend from the operating floor to the point of discharge.
- 4. Bar racks designed to mount to the equipment side frames in lieu of the concrete channels will not be acceptable.

C. Base Frame:

- 1. A base frame that structurally supports the side frames shall be provided that is designed to prevent flexure of the assembly.
- 2. The base frame shall encircle the bar screen Unit on all sides, and shall be fabricated from channel sections, of 18 inch minimum.

D. Mechanism:

1. Side Frames:

- a. Fabricate from A-36 steel channel, 19" wide minimum, and 3/8-inch thick plate with angle guide tracks, reinforced to support the required loads. Back bracing is prohibited. Securely fasten to the concrete channel.
- b. Provide an access door in each side frame for access to and removal of the rake carriage.
- c. The side frames shall be designed such that they do not extend to the channel invert, and shall *not* be used to anchor the bar rack.
- d. The side frames will incorporate pin rack mounting blocks at regularly spaced intervals that have been accurately machined with recesses to accept the pin rack. Designs that incorporate "slip critical" pin rack mounting are not acceptable.
- e. The lower end of the side frames will incorporate both inner and outer bearing surfaces to ensure a smooth transition of the drive carriage from the front to the back of the pin rack. The inner radial bearing surface shall be machined from solid steel stock to form a semi circular path. The outer bearing surface shall consist of a semi circular guide that will be machined from bar or pipe stock then stress relieved prior to final assembly. Designs that use rolled flat stock with gussets will not be allowed for this

- project. Designs that do not employ such a guide path will not be allowed for this project.
- f. The cam follower offsets will be accurately machined from solid steel stock and matched. Designs that use rolled flat stock with gussets will not be allowed.

2. Pin Rack and Involute gears:

- a. Mount pin rack in each side frame via solid machined blocks to mesh with the two cogwheels.
- b. Pin rack components:
 - 1) 304 stainless steel bolts fitted with hardened and ground steel bushings and rollers AISI 1018, 50 Rc min.
 - 2) Involute gears AISI 1144 steel, hardened with a Rc 50 minimum, electroless nickel-plated.
- c. Rollers, Bushings, Bolts, and Nuts: Individually replaceable. Designs in which pin rack nuts are inaccessible are not acceptable. The use of individual or linked ANSI chain components modified for this application are not acceptable. The use of non-metallic rollers and/or bushings shall be specifically prohibited.

E. Rake Assembly

- 1. The rake assembly shall consist of a rake, rake arm, follower rollers, involute gears (cogwheels), drive shaft, gear reducer, brake motor, and all required electrical junction boxes properly designed for the area classification.
- 2. The rake shall consist of a 304 stainless steel shelf and tines a minimum of 10-inches deep attached to one rake arm of 3"x5"x1/4" rectangular tubing.
- 3. The guide rollers shall travel in precisely located tracks welded inside the side frame to ensure proper alignment of the rake assembly.
- 4. The mechanism shall be designed so that the rake can climb over and be free of an object encountered that cannot be removed. This motion shall be powered by the rotation of the drive to swing the rake away from the bar rack. Designs which rely on the upward travel of the rake to pull the rake over obstructions shall not be approved. After the object has been bypassed, the rake shall again mesh with, and continue to clean the bar rack.
- 5. The rake assembly shall be supported by the main drive shaft utilizing gears of the "true involute" tooth profile. The gears shall have 17 teeth and shall be designed to have two teeth per gear remain in contact with the pin rack 84% of the cycle time.

6. Drive Unit:

The electrical drive motor shall be designed for use in a Class I, Division II, Group D location, and rated 460/60/3, TEFC severe-duty, squirrel cage induction brake motor with a 1.15 service factor at 40°C. The motor shall be close-coupled to a reducer and shall have an efficiency not The motor shall be class F insulation with Class B less than 76%. temperature rise and shall be supplied with manufacturer's standard finish. The drive shall have a minimum capacity of 1 ½ horsepower. The gear reducer shall be of the helical-worm type, with a rugged cast iron housing and have a service factor rating of 1.25 based on design running load. The gear reducer should be rated for a maximum design output torque at not less than 10,795 inch-pounds at the normal output shaft rpm of 11. Gear reducer bearings shall be anti-friction with oil bath lubrication. The motor shall contain a spring-loaded electromechanical brake released by energization of the operating coils simultaneously with starting the motor. Brake motor shall comply with either NEMA or DIN Standards. The use of a belt drive is not acceptable.

- 7. Overload protection against an object that is too large to be bypassed shall be provided by mounting the drive on a pivoting, spring-restrained motor support.
 - a. If the load on the rake carriage mechanism increases beyond a predetermined value, the motor shall impart a torque to the rake arm and drive to rotate about the axis of the drive shaft causing a proximity switch to stop the motor. The carriage will then automatically reverse to the park position and sound an alarm.
 - b. The rake assembly shall also be designed to be reversed by manually operated electrical controls.
 - c. When the overload condition has been corrected, the drive may again be operated by manual or automatic operation.
- 8. The rake shall be traversed forward over the discharge chute apex 4-inches by action of the guide follower rollers and cams mounted in the side frame. To minimize wear and bouncing, this action shall be accomplished by the use of a machined cam mounted in the side frame tracking system. The use of angle as a cam is not acceptable. The wiper shall be designed to pivot to allow efficient cleaning of the rake on each pass and cushioned during travel to the rest position by two (2) hydraulic shock absorbers. Counterweighted wiper assemblies, motorized wiper assemblies and/or rubber bumpers are not acceptable.

G. Power Cable:

- 1. Provide electric power to the screen drive motor through a suitably mounted electrical cable.
- 2. Type: Standard pendant and reel cable suitable for extra hard usage with an internal fiber strength cord surrounded by the stranded conductors.

H. Screenings Press

1. Conveyance:

- a. Conveyance shall be by means of a screw with an 8-inch minimum diameter as indicated in the Schedule. The screw shall be constructed of carbon steel (ASTM-A36) flights welded to a (AISI-C-1020) carbon steel solid shaft with a minimum diameter of 3-inches. All flights shall have a minimum thickness of ½-inch. The screw shall extend a minimum of 19-inches beyond the end of the inlet hopper.
- b. The pressing zone cylinder shall be 304 stainless steel pipe horizontally mounted with an overall length to the discharge flange as indicated on the drawings. Integral rectangular solids inlet hopper with flanged connections shall be mounted/supported over the screw housing/pressure zone cylinder. Rear leg, front leg, and intermediate leg supports, as required, shall be furnished for rigid support to existing concrete floor

2. Screenings Inlet Hopper:

a. The inlet hopper shall be made of 10 gauge minimum thickness 304 stainless steel plate, flanged top and bottom. The hopper openings at the lower flange or screw housing level shall be approximately 36" x 8". The sidewalls shall be inclined at 60° from the horizontal axis to allow preliminary screenings containment above the screw conveyor.

3. Drainage Trough:

a. The full length drainage trough shall be made of 12-gauge 304 stainless steel sheet. Trough shall be equipped with a 3-inch minimum diameter drain outlet. The drainage collecting trough shall be easily removable for occasional cleaning/flushing/ maintenance purposes. Trough shall also be supplied with two (2) lateral inspection ports having dimensions of approximately 4" by 20". Provide 1-inch pipe flushing connections at each end of drainage collecting trough to allow washing/cleaning of trough, and also to prevent the over-accumulation of compacted screenings material into the drainage slots.

4. Spray Watering System:

a. A washing system shall be installed between the collecting troughs and the screw housing. The washing system shall be designed to clean the trough and also prevent the accumulation of compacted material into the drain holes. It shall be controlled by a solenoid actuated valve actuated by a timer in the control panel. Necessary piping and solenoid valve shall be furnished and installed as part of the equipment.

5. Screenings Discharge Pipe:

- a. The discharge pipe shall have a minimum diameter of 8-inches, and be made of Schedule 40 (.322" thick) 304 stainless steel pipe. Discharge pipe shall be inclined at 45°, oriented as shown on the Drawings. Discharge pipe shall be designed to avoid any jamming of the partially dewatered/compacted screenings inside the discharge pipe.
- b. A discharge piping chute shall be installed with necessary attachments to discharge the screenings to a dumpster below to eliminate scattering of the screenings.

6. Gear Motor:

- a. The constant pitch screw shall be powered by a helical speed reducing gear motor 1 ½ -hp, 1200 rpm, 460-volts, 3-phase, 60-cycles. The motor shall be TEFC type with normal starting torque and low starting current. The gear reducer shall have a minimum torque output of 1.4 when applied to the motor nominal horsepower.
- b. The reducer shall include anti-friction bearings with high overhung load properties and oilseal, double-lip, high temperature synthetic riding on precision ground shaft, to minimize leakage possibilities. Speed reducer shall be enclosed in a cast iron weatherproof casing. Gears shall be made of hardened and heat treated forged steel. The gear motor shall not be overloaded under any normal operating conditions and shall be designed for heavy duty service. The gearing shall be oil lubricated.

7. Gear Head:

- a. The gear motor shall drive a gear head consisting of gears manufactured from case hardened steel and hardened to 58-62 Rockwell C. All gear teeth shall be ground to ensure accurate profile (AGMA, Class II). The main bearing shall be sufficiently wear resistant to stand heavy duty service. The axial load developed by the compacting screw shall be neutralized by a built-in spherical thrust bearing.
- b. The gear head shall be mounted inside a totally enclosed oil filled gear box designed with a high cross section module with stiffening webs for maximum rigidity with a service factory of 2.0. The gear box shall support the cantilevered screw shaft and shall be protected from foreign matter entry by a set of two (2) seals.

8. Screw Housing:

a. The screw housing shall be made of Schedule 40 (.322" thick) 304 stainless steel pipe with top/flanged openings to surmount the screenings inlet hopper. The lower section of the housing shall be provided with drain holes countersunk from the outside diameter. These openings shall allow the water to drain freely and shall be designed to limit premature clogging.

9. Control Panel:

- a. An automatic control panel shall be supplied with the screenings press. All electrical components shall be furnished prewired to identified terminal blocks in a NEMA 4X stainless steel enclosure. The power supply of 460-volts, 3-phase, 60-cycles will be connected by electrical to the control panel.
- b. The controls shall be complete with pushbuttons, pilot lights, intrinsically safe relays, starters, timers, etc., to make a complete and fully operational package, and shall include a door interlocked main flushed disconnected size for the application with front mounted handle and magnetic starter for the motor, complete with adequate overload protection and a 120-volts control circuit transformer.
- c. The operation of the screenings press shall be initiated by a signal from the bar screen control panel. The duration of the compacting cycle shall be established by timers provided within the control panel.

10. Local Control Station:

a. One (1) local control station will be supplied to be mounted locally to the screenings press. This panel shall be complete with one (1) "Reverse-Off-Forward" selection switch. One (1) "Hand-Off-Auto" selector switch, and one "Jam" reset pushbutton, prewired, and mounted in a stainless steel enclosure rated NEMA 4X.

11. Trip Wire:

a. Machine and operator safety shall be achieved by use of a safety trip wire system designed to actuate at 20 lbs force to immediately stop the auger.

12. Spare Parts:

- a. The following spare part shall be furnished:
 - i. One (1) spherical thrust bearing.

13. Suggested Manufacturers:

a. The screenings press shall be a Model 200 HelicoTM Screenings Press by ONDEO Degremont.

14. Screenings Press Schedule:

a.	Type	Screenings Press (Screw compactor)
b.	Location	Headworks
c.	Screw Diameter	8-inch minimum
d.	Screw Shaft Diameter	3-inch minimum (solid-shaft)
e.	Screw Length (ft.)	5'-6" ±
f.	Capacity (cu.ft./hr)	25
g.	Screw Blade Thickness	½ -inch
h.	Screw Housing	Schedule 40 pipe 8-inch with
		full length drainage trough
i.	Outlet Pipe	Schedule 40 pipe 8-inch minimum
j.	Inlet Hoppers	10-gauge, 304 stainless steel plate
k.	Motor Description	460/60/3, TEFC
		high efficiency,1 ½ -hp
		Service factor 1.15
1.	Spare Parts	One (1) spherical thrust bearing
m.	Accessories	Provide support anchor bolts, 304
		stainless steel
n.	Control Panel	NEMA IVX
0.	Local Control	NEMA IVX local station

2-03 LIMIT SWITCHES

A. Heavy-duty industrial type proximity switches shall be SPDT "GO-switches" or equal. The switches are to be stainless steel, rated 10 amps, 120 VAC, NEMA 4X and approved and labeled by UL for Class I, Division II, Group D, atmosphere.

2-04 CONTROLS

- A. The screen manufacturer shall provide one Main Control Panel for each bar screen. This Panel shall be a NEMA 4X rated stainless steel enclosure mounted remotely to the bar screen, and contain the following logic devices for proper screen operation:
 - 1. Relays, timers, and alternator as required to monitor the screen mounted limit switches and float switch, and perform necessary logic functions.
 - 2. Control Power "OFF/ON" selector switch.
 - 3. "Torque Overload" alarm light (amber) to indicate failure due to a torque overload condition.
 - 4. "High Channel Level" alarm light (amber).
 - 5. "Screen Forward" run indicating light (red).
 - 6. "Screen Reverse" run indicating light (red).
 - 7. One "Reset" push-button

- 8. Alarm silence push-button.
- 9. Alarm horn.
- B. Two (2) solid-state timers will be provided to automatically initiate operation of the bar screen. One (1) frequency of run timer adjustable from 10 to 10,230 seconds (in 10 second increments), one duration timer adjustable from 1 to 1,023 seconds (in 1 second increments).
- C. An ultrasonic differential controller shall be provided to automatically initiate the operation of the bar screen when a predetermined headloss in inches is sensed across the bar rack. The controller shall allow the headloss setpoint to be adjusted.
- D. One (1) secondary control station(s) to be mounted locally (within sight of the bar screen) and rated NEMA 4X shall be provided, (each) containing one (1) "Hand-Off-Auto" selector switch with lockout provision, in the Off position, and one (1) "Reverse-Off-Forward" selector switch.
- E. Main circuit breakers and a reversing magnetic starters, with a control transformer rated 250VA extra capacity, shall be supplied by others, and located in the customers motor control center.

2-05 FINISHES

- A. Commercial blast and shop prime all surfaces as specified in Section 09900.
- B. Provide Manufacturers' standard machinery finishes for all motors, gearboxes, and controls.

PART 3- EXECUTION

3-01 INSTALLATION

A. Install equipment covered under this Section in accordance with Manufacturers' recommendations.

3-02 FIELD QUALITY CONTROL

A. After CONTRACTOR and CONTRACTING OFFICER have mutually agreed that the equipment installation is complete and ready for continuous operation, CONTRACTOR and a qualified field service representative of the manufacturer shall conduct an operating test of the screens and their controls in the presence of CONTRACTING OFFICER to demonstrate that each screen and its controls will function correctly.

1. Running Tests:

a. Field-test each screen unit together with its controls. Test shall demonstrate to CONTRACTING OFFICER that each part and all parts together function in the manner intended. All necessary testing equipment and manpower shall be provided by CONTRACTOR at his expense.

b. In the event that the CONTRACTOR is unable to demonstrate to CONTRACTING OFFICER that his equipment meet the requirements of the test, the deficient equipment will be rejected and CONTRACTOR shall adjust and/or modify and retest the equipment as often as necessary to meet the specified requirements.

3-03 MANUFACTURER'S FIELD SERVICES

- A. The services of a factory trained representative of the manufacturer shall be provided to inspect the installation of the equipment, make any necessary adjustments (before initial start-up), place it in initial trouble-free operation, and instruct the operating personnel in its operation and maintenance.
- B. Three (3) days of service are required per Unit. Each trip shall include one (1) day of training/inspection for each of the following three (3) hold points:
 - 1) Initial Installation and Pre-grout Inspection
 - 2) Final Alignment
 - 3) Start-up and O&M Training

DIVISION 15 - MECHANICAL

SECTION 15382

HYDRAULIC REMOVAL CLARIFIERS

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SECTION 15382

HYDRAULIC REMOVAL CLARIFIERS

PART 1 - GENERAL

1-01 SUMMARY

A. Description of Work

- 1. Provide all labor, material and equipment to furnish and install hydraulic removal type clarifiers as specified herein.
- 2. This specification covers the general requirements for the design, fabrication and installation of two (2) clarifiers.

B. Work and Components Included (But Not Limited To)

- 1. The Equipment Manufacturer shall furnish the items listed below:
 - a. Drive mechanism complete with reducer, motor, microswitch overload device, and shear pin.
 - b. Center support pier, anchor bolt template, and grout shield.
 - c. Unitube sludge removal header and supports, center cage, truss arm, and manifold.
 - d. Access bridge including center platform, hand railing and toe plate.
 - e. One (1) surface skimmer with skimmer blade.
 - f. One (1) scum trough and ramp with flushing device.
 - g. Influent feed well and supports.
 - h. Associated attachment bolts and anchor bolts for above.
- 2. Like items of equipment specified herein shall be the end products of one manufacturer in order to achieve standardization for operation, maintenance, spare parts and manufacturer's service.
- 3. Manufacturer of clarifier equipment must co-ordinate with the manufacturer of the aeration basin equipment to assure that design criteria as stated in Section 15390 Aeration Basin are met.

C. Work Not Included

1. The following items are specified under other sections of these specifications:

a.	Concrete and Grout	Section 03300
c.	Metal Fabrication	Section 05500
d.	Paint	Section 09900
e.	Electrical	Section 16000

1-02 QUALIFICATIONS

A. Manufacturer

- 1. It is the intention of this specification to cover minimum acceptable quality for a complete installation with the exception of the motor controls, electrical work and piping requirements.
- 2. Part numbers or trade names are used in this specification only to facilitate the general configuration and description of the equipment desired and in no way implies that equal equipment of other manufacturers cannot be used. Products of other manufacturers will be considered in accordance with the Alternate Equipment section of this specification.

B. Manufacturer's Experience

- 1. The equipment Manufacturer shall have not less than five (5) successful years experience in the design, construction and operation of the type specified at ten (10) different plants.
- 2. The Contracting Officer may require evidence, in the form of operating records, from these plants to substantiate any claims concerning the ability of the equipment to perform as required.

1-03 SUBMITTALS

A. Operating instructions, manuals and shop drawings shall be submitted in accordance with Section 01330 – Submittal Procedures.

B. Alternate Equipment

- 1. If the Contractor desires to offer equipment as an alternate to the specified equipment, he shall submit, within 14 days after the bid opening, substantial descriptive information in order that the Contracting Officer may determine if the proposed alternate is equal or superior quality to that specified.
 - a. No alternate will be considered unless, in the opinion of the Contracting Officer, it conforms to the specification in all respects except manufacturer and model and minor details. Material variances will not be allowed.
 - b. Alternate equipment which is a "standard product" of the Manufacturer shall be modified, redesigned, or furnished with special features or special materials as may be necessary to conform to the requirements of this specification and contract drawings.
 - c. The Contracting Officer reserves the right to decide whether or not the proposed alternate will be acceptable.

- 2. Descriptive information shall include the following:
 - a. List of ten (10) installations of equipment in successful operation of the design in all essential regards as specified.
 - b. Field dye performance data verifying the proposed header design proportionately removes sludge from the entire tank bottom. Test site and testing laboratory shall be identified along with test methods and apparatus used. Data shall be from an existing multiple orifice system incorporating a tapered header width operating under the following conditions:
 - 1. Minimum 70' diameter basin with minimum 10' side water depth.
 - 2. Flow and pressure head within the header shall be recorded at each orifice while the header rotates.
 - 3. Return sludge concentrations not less than 5,000 mg/l with not less than 1 MGD with maximum withdrawal rate at least 3 times minimum.
 - 4. Maximum velocity in header of 3.0 to 4.5 fps.
 - 5. Maximum header headloss at maximum flow not less than 1.0 feet.
 - 6. Actual pick-up of sludge shall be in close agreement with the ideal pick-up curve for uniform removal based on floor area swept.
 - 7. Calculations will not be an adequate substitute for dye verification data.
 - c. Written certification that the proposed drive meets AGMA standards. Drive mechanism calculations prepared by a registered professional Contracting Officer shall be submitted for approval along with published torque value of the proposed drive.
 - d. General arrangement of drive unit verifying AGMA torque, overload protection system, housing and gear materials and horsepower. Provide values used for the following AGMA design parameters per AGMA Specification 6034:
 - 1. Pitch diameter of worm gear (in.)
 - 2. Effective face width of gear (in.)
 - 3. Lead angle of threads at mean worm diameter (deg)
 - 4. Normal pressure angle of worm thread (deg)
 - 5. Sliding velocity of worm at mean diameter (fpm)
 - 6. Number of teeth
 - 7. Service factor. Use 1.25

Provide the following AGMA design parameters per AGMA 2001:

- 1. Pitch diameter of pinion and spur gear (in.)
- 2. Face width of narrowest of two matting gears (in.)
- 3. Pitch line velocity of pinion (fpm)
- 4. Allowable bending stress (Sat) of pinion and spur gear material (psi)
- 5. Allowable contact stress (Sac) of pinion and spur gear material (psi)
- 6. Geometry factor (J) for bending

- 7. Geometry factor (I) for pitting resistance
- 8. Load distribution factors Cm and Km
- 9. Dynamic factors Cv and Kv
- 10. Life factors Cl and Kl at 420,000 cycles of the main gear
- 11. Number of teeth
- 12. Reliability factors, Cr and Kr equal to or greater than 1.0
- d. Complete test procedure for torque testing the collector mechanism for the AGMA torque specified.
- e. Complete assembly drawing of the collector components giving:
 - 1. Type of material used for each component
 - 2. Dimension, thicknesses and weights of each component
 - 3. Header details giving orifice diameter, distance from center and cross section of header at each orifice
 - 4. Manifold seal detail

1-04 EQUIPMENT MANUFACTURER'S SERVICE REPRESENTATIVE

A. Installation Assistance

- 1. Provide for installation assistance as required for the equipment supplied.
- B. Operating Instructions and/or Operator Training
 - 1. Provide for one (1) four (4) hour working period total to instruct plant Operators for the equipment supplied. The training period will be integrated by the Owner with overall training.
 - 2. An additional one (1) trip not less than one-half day shall be provided for operation assistance of the equipment supplied.

1-05 GUARANTEE AND WARRANTY

A. The equipment shall be guaranteed to meet or exceed the design criteria detailed in Part 2 of this specification.

PART 2 - PRODUCTS

2-01 GENERAL

A. The design and layout shown on the drawings are based on the manufacturer shown in Section 2.02. If equipment other than that of the manufacturer shown is submitted to the Contracting Officer for consideration as an equal, it shall be the responsibility of the Contractor to submit a revised drawing of the mechanical equipment and basin layouts acceptable to the Contracting Officer. This revised drawing shall show the proposed location of the substitute unit, and area required

for withdrawal space of replacement or serviceable components. This drawing shall also show clearances of adjacent equipment and service area required by that equipment.

B. Changes in architectural, structural, electrical, mechanical and plumbing requirements for the substitution shall be the responsibility of the Contractor. This shall include the cost of redesign by affected designers.

2-02 MANUFACTURERS

A. Model 80-16-1, "TOW-BRO®" Unitube Sludge Remover by USFilter/Envirex Products, of Waukesha, WI or approved equal.

2-03 EQUIPMENT

A. General

- 1. Furnish and deliver suction type sludge collectors for installation in two (2) new concrete settling tanks.
 - a. Tank diameter to be 80 feet.
 - b. Tank side water depth to be 14 feet.
 - c. Tank freeboard to be 2 feet.
 - d. Floor slope to be 1/16 inch per foot.

2. Sludge Collector Mechanism

- a. Provide a center pier supported, siphon feed design with peripheral overflow.
- b. Provide a center drive mechanism that supports and rotates a structural steel cage to which is attached a Unitube sludge collection header and manifold.
- c. The header shall be parallel to the tank floor and have a series of inlet orifices such that the entire tank bottom is swept clean in a single revolution.
- d. The header shall be designed to uniformly remove sludge in proportion to the area swept with the removal of a larger volume of sludge at greater distances from the tank center.
- e. Sludge shall be transported through the header to the center manifold, with removal being accomplished by hydrostatic pressure.
- f. Fabricated steel structures shall be shipped in the largest sub-assemblies permitted by carrier regulations, properly matchmarked and identified for ease of field erection.

B. Design Criteria

1. Hydraulics shall be designed to handle (per basin):

	MIN.	AVE.	MAX.	PEAK
Effluent Flow (MGD)	1.00	2.00	4.00	5.00
Return Flow (MGD)	1.00	2.00	2.00	3.00
Mixed Liquor Flow (MGD)	2.00	4.00	6.00	8.00

2. Maximum headloss for header

1.10 ft

3. Minimum flow velocity in header

0.50 fps

4. Minimum header orifice diameter

2.0 inch

- 5. Center Pier diameter 31.5 inch
- 6. Influent Well size 19'-9" dia. x 6'-0" depth
- 7. Drive
 - a. Internal gear pitch dia. 38.0".
 - b. Ball race dia. 42.0".
 - c. Motor horsepower 0.50 HP.
 - d. AGMA rated torque 21,900 ft. lbs. with 1.25 service factor
 - e. Speed 0.04 RPM.

C. Structural Members

- 1. Structural steel to conform to ASTM A36.
- 2. Structural steel components shall have minimum thickness of 1/4".
- 3. All welding to conform to American Welding Society Standard AWS D1.1. Structural support members shall be shop welded for bolted field assembly. Field welding shall be limited to bridge splices and tack welding of skimmer connections after final positioning.
- 4. Design components so that stresses developed do not exceed allowable stresses, as defined by current AISC standards when designed for the AGMA rated torque.
- 5. Panel lengths and member sizes shall be selected such that slenderness ratios do not exceed 200 for compression and 240 for tension. For strength, the controlling member force shall be used to determine member size.
- 6. Maximum deflection in a span under combined live and dead loads shall not exceed L/360.

D. Drive Mechanism

1. General

- a. Drive mechanism consisting of primary helical gear reduction, intermediate worm gear reduction unit and enclosed final reduction unit consisting of internal spur gear and pinion in a turntable base is to be completely assembled and finish painted in the Manufacturer's shop.
- b. All gearing shall be enclosed in gray cast iron ASTM A-48 Class 40B housings. Fabricated steel housings, exposed gearing and submerged bearings will not be acceptable.

- c. The drive shall be designed to allow removal and replacement of internal gear, balls and strip liners without raising the walkway.
- d. All components of the drive mechanism shall be designed in accordance with AGMA Standard 6034-B92 (February 1992) "Practice for Enclosed Cylindrical Worm Gear Speed Reducers and Gearmotors", and Standard 2001-C95 (January, 1995) "Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth"; for 24-hour continuous, uniform load duty and 20-year design gear life at the specified output speed. The AGMA rated torque of the drive shall be the lowest value computed for worm gear set, spur gear and pinion for strength and durability.
- e. Select conservative values for bending strength and pitting resistance life factors Kl and Cl based on a minimum of 420,000 cycles of the main gear. The drive AGMA torque rating shall be as specified above with a minimum 1.25 service factor.
- f. All bearings shall be designed for a minimum B-10 life of 200,000 hours.

2. Primary Reduction Unit

- a. Provide commercially available helical gear reducer or gear motor in a cast housing.
- b. All bearings shall be anti-friction type running in oil.
- c. Motor shall be totally enclosed, ball bearing type, of ample power for starting and continuously operating the drive mechanism without overloading.
- d. Motor to conform to NEMA standards and be suitable for operation on 480 volt, 3 phase, 60 Hertz current.
- e. Primary reduction unit shall drive the intermediate reduction through a chain and sprocket arrangement with #80L self-lubricating chain and non-corrosive OSHA approved removable chain guard.
- f. Provide proper chain tension by an adjustable steel base mounted on the intermediate reduction unit.

3. Intermediate Reduction Unit

- a. Provide worm gear speed reduction with grease and oil lubricated antifriction type bearings in cast iron housing securely bolted on the machined top face of the final reduction unit. Worm and shaft shall be a two-piece assembly for ease of maintenance. Cycloidal and planetary gearing will not be acceptable.
- b. Align and maintain accurate centers with the final reduction gearing. Swivel base mounting of the intermediate unit will not be acceptable.
- c. Mount an electro-mechanical overload device on the thrust end of the worm shaft consisting of plate spring assembly, plunger, indicator dial two (2) microswitches (one N.O. and one N.C.) and a terminal block, all enclosed in a weather tight, gray cast iron housing. Amperage metering devices will not be considered equal to the overload device specified.
- d. Microswitches shall be factory set to: (1) sound an alarm when the load on the mechanism reaches 100% of the AGMA torque; and (2) stop the motor when the load reaches 120% of the AGMA torque.
- e. Provide a shear pin device, set for 130% of the AGMA torque mounted on

the drive end of the worm shaft.

4. Final Reduction

- a. Provide internal, full depth involute tooth design, ductile iron spur gear driven by a heat treated steel pinion from the slow speed shaft of the intermediate reduction unit. Stub tooth design will not be acceptable.
- b. Provide bearings at top and bottom of pinion to ensure complete tooth contact between mating surfaces. Pinion and pinion shaft shall be furnished as a two-piece assembly for ease of maintenance.
- c. Provide cast iron turntable base with annular raceway to contain balls upon which the internal gear rotates. The ball race shall ensure low unit ball load, long life and stability without the use of submerged guide shoes, bumpers or steady bearings.
- d. Provide four (4) 3/8" thick x 3/4" wide renewable special hardened (38-42 Rockwell C) steel liner strips force fitted (pins and cap screws not permitted) into the turntable base and internal gear for balls to bear on vertically and horizontally.
- e. Provide an internal gear of split design with precision mating surfaces for ease of removal of gear, balls and liner strips without raising bridge.
- f. Internal gear, pinion and balls to run in an oil bath and be protected by a felt seal and vertical steel dust shield.
- g. Provide oil filling and level pipe along with a drain plug and sight gauge.
- h. Turntable base shall be bolted to the center column and be designed to support the bridge, internal gear and rotating mechanism.

E. Influent Feedwell

- 1. The influent well fabricated from 3/16" steel plate sections supported from the drive cage or bridge extensions.
- 2. Incorporate steel stiffeners at the top and bottom to maintain shape and rigidity.
- 3. Feedwell shall be of adequate size to diffuse the flow into the tank at a uniform flow through velocity.
- 4. Ports shall be cut into the influent well to permit entrapped scum to escape.
- 5. Ports shall be baffled to prevent short circuiting to the weirs.

F. Center Pier

- 1. A cylindrical 1/4" thick steel plate center pier shall support the drive, collector mechanism and access bridge.
- 2. Top of pier to have a drive mounting plate set plumb with the centerline.
- 3. Drive to be positioned, leveled and grouted in place on top of pier with a non-shrink grout.
- 4. Manufacturer to provide minimum eight (8) 1" diameter anchor bolts and steel template/grout shield to accurately locate anchors.
- 5. Center pier shall serve as the influent pipe.
- 6. Center pier shall have a minimum of four (4) overflow areas at its upper end to diffuse flow into the influent well at a velocity not to exceed 1.75 fps at design mixed liquor flow.

G. Sludge Collection Header

1. Provide a fully tapered, rectangular-shaped Unitube header varying in cross

- section from a maximum near the tank center to a minimum at the outer wall.
- 2. Fabricate header from 1/4" thick steel plate and hot-dip galvanized after fabrication. Provide steel plate counterweights not exceeding 50 lbs. each as necessary for proper equipment balance. Field welding of galvanized header or supports will not be allowed.
- 3. Longitudinal cross sectional axis to be mounted at an angle of 45 degrees to tank bottom to trap sludge.
- 4. Provide a 2" fluidizing vane as an integral part of header.
- 5. Attach flexible squeegee to fluidizing vane provided with 1" vertical adjustment.
- 6. Manufacturer to size and space header inlet orifices at regular intervals not exceeding 30".
- 7. Orifice design to be proportionate to the volume of sludge withdrawn from the entire tank floor at all flows.
- 8. Provide header flange with silicone seal for bolted connection to center manifold. Provide horizontal header support from cage through steel tie-bars with adjustable galvanized clevis assembly and locknuts.
- 9. Alternate Manufacturers shall submit header verification field data in accordance with the Substitute Equipment Section of this specification.
- 10. Sludge withdrawal by means of individual riser pipes or stepped header construction will not be acceptable.

H. Center Cage, Truss Arm and Manifold

- 1. Center cage to be of an all-welded construction made up of structural steel members having a minimum thickness of 1/4".
- 2. Provide a truss scraper arm opposite the Unitube header for skimmer support.
- 3. Truss arms to be constructed of 1/4" minimum thickness members pinned at the base and connected to the center cage through adjustable galvanized clevis assemblies with locknuts requiring no tie-bar supports.
- 4. Provide a cylindrical manifold with two (2) seals for bolted connection to the sludge collection header and bottom of cage. A bottom seal plate shall be furnished by the equipment Manufacturer securely anchored to the floor and grouted in place after final adjustment.

I. Access Bridge

- 1. Provide a bridge of wide flange beam or pony truss construction extending from the tank wall to the stationary drive base.
- 2. Provide a bridge extension to provide access to the farside of the drive mechanism.
- 3. Bridge to be designed for the dead load and a live load of 50#/sq. ft., with a deflection not exceeding 1/360 of the span.
- 4. Provide a 3' wide walkway of 1-1/4" x 3/16" aluminum grating extending over the entire bridge length.
- 5. Provide a 2-rail handrail consisting of 1-1/2" diameter, Sch. 40 welded aluminum pipe for rails and posts. Omit handrail only where truss bridge members at 21" and 42" above the walkway provide the same function.
- 6. Provide a 4" high aluminum toe plate along both sides of bridge and bridge extension.

7. Provide a minimum 9' x 8' rectangular platform to provide working clearance around the drive.

J. Surface Skimmer

- 1. Provide one (1) "full radius" skimmer consisting of scum blade, hinged wiper assembly and scum trough.
- 2. Support the scum blade along its length with structural "A" frames bolted to the truss arm at 12' maximum spacing.
- 3. Mount the hinged wiper assembly on the outer end of the scum blade to form a pocket for trapping scum.
- 4. The wiper assembly shall maintain continual contact and proper alignment between scum blade, outer scum baffle and scum trough.
- 5. The wiper blade shall have a wearing strip on its outer end which contacts the scum baffle and neoprene strip on its inner and lower edges which contact the scum trough.
- 6. All springs, pivot points and threaded fasteners shall be constructed of 18-8 stainless steel.
- 7. The scum trough and beach shall be fabricated of 1/4" thick steel plate, supported from the tank wall.
- 8. Scum trough shall be 4'-0" wide with an overall length of 4'-9" along the scum baffle consisting of beach plate, inner radius baffle, hopper and 6" discharge pipe.
- 9. Beach plate to slope at a nominal incline of 1-3/4" per foot to a point 5" below the maximum water elevation. The submerged trough shall continue on a horizontal run for an additional 4' along the scum baffle. An inner radius baffle extending 9" below and 3" above maximum water level shall run from the trough to the end of the submerged shelf.
- 10. Provide a counterweighted flushing device actuated by the main tank skimmer arm. Actuator arm shall pivot on a 3/4" minimum diameter stainless steel pin riding in an oil impregnated sintered bronze bushing. The actuator arm shall be counterweighted by steel plates to assure positive valve closure. The flapper valve shall be held open to allow 15 to 20 gallons of flushing water per trip.

K. Effluent Weirs and Scum Baffles

- 1. Fabricate weirs from 3/16" thick x 10" stainless steel.
- 2. Weir shall have 90 degree, 3-inch deep "V" notches spaced 6" on centers.
- 3. Fabricate scum baffle from 1/4" thick x 22" stainless steel.

L. Anchor Bolts

- 1. All equipment anchor bolts shall be Type 316 stainless steel.
- 2. Equipment Manufacturer shall furnish steel template and grout shield to accurately locate center pier anchors and allow for grouting beneath the pier and manifold seal plate after final plumbing.

PART 3 - TESTING

3-01 TORQUE TEST

- A. Test by anchoring both sludge collector arms of one (1) collector.
- B. Start collector drive to demonstrate the structure's ability to withstand loads resulting from at least 120% of clarifier drive design torque.
- C. Demonstrate proper operation of high torque alarm and cut-off.
- D. Repeat test to verify results.

PART 4 - EXECUTION

4-01 INSTALLATION

- A. The Contractor shall install the clarifier as shown on the drawings.
- B. Equipment shall be installed in accordance with GENERAL MECHANICAL REQUIREMENTS and in accordance with the Manufacturer's recommendations to provide a complete installation.
- C. The Contractor shall plumb, adjust for true plane of rotation, grout beneath center pier, manifold seal plate and drive unit and grout the floor in accordance with the Manufacturer's recommendations.

4-02 ELECTRICAL CONNECTIONS AND WIRING

A. Wiring and conduits for electrical power, control and instrumentation will be provided by the Electrical Contractor under DIVISION 16 - ELECTRICAL.

DIVISION 15 - MECHANICAL

SECTION 15383

CLARIFIER ALGAE SWEEP

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SECTION 15383

CLARIFIER ALGAE SWEEP

PART 1 - DESCRIPTION

- 1-01 An apparatus for cleaning algae and debris from the baffle, weir, spillway and effluent flow launder of a circular clarifier. The system consists of an attachment sleeve mounted to existing clarifier equipment as directed by clarifier manufacturer, a mainframe member, several telescopic brush arms, numerous brushes of various sizes, and an assortment of springs in different configurations to provide the biasing forces. A series of brushes are mounted to the frame member and biased into engagement with the baffle, weir, spillway and walls of the effluent flow channel. Furthermore, a bridging device is positioned over the effluent discharge hole to support the launder brush assembly. All metallic parts of the automated brush system shall be constructed of Type 316 Stainless Steel except for the attachment assembly which shall be constructed of Galvanized Steel.
- 1-02 Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.

PART 2 - GENERAL

- 2-01 The automated brush system shall be custom designed, constructed, for the removal of algae and debris and installed on a circular clarifier. The supplier must have a factory service technician on site for a minimum of up to three (3) working days/unit to observe and advise the installation of automated brush system, during one mobilization trip to site. This on site observation period shall include the fine-tuning brush adjustment segment of installation.
- 2-02 The automated brush system for algae and debris control shall be designed for a brush to make contact with each of the following surfaces:

Inner Baffle
Outer Baffle
Inner Weir(s)
Outer Weir(s)
Top Spillway Surface
Angled Spillway Surface
Inner Launder Wall
Launder Bottom
Outer Launder Wall

- 2-03 The automated brush system shall be designed to work off the power of the clarifier drive motor. The system shall be constructed to avoid any noticeable torque increases. The unit shall be capable of encountering an indefinite stall without incurring damage.
- 2-04 The unit shall be designed with an engaged position for cleaning, and a disengaged position allowing the system to ride idle around the tank.

PART 3 - ATTACHMENT ASSEMBLY

- 3-01 The Attachment Assembly shall provide a means of attaching the automated brush system to the skimmer arm and or rake truss so as not to interfere with any other operations of the skimmer arm (such as the effective skimming of floatable solids or the operation of the skimmer blade assembly at the scum box).
- 3-02 The Attachment Assembly shall be custom designed for each specific clarifier. It shall be constructed of Galvanized Steel.

PART 4 - MAINFRAME

- 4-01 The automated brush system Mainframe shall be constructed of Type 316 Stainless Steel and designed to slip easily into the Attachment Assembly and be tightened in position with the use of set screws.
- 4-02 The Mainframe shall be designed so that the Brush Arms can be positioned at any point on the Mainframe.
- 4-03 Extra counterweights shall be installed on the opposite end of the clarifier arm to balance the system as needed.

PART 5 - BRUSH ARMS

- 5-01 All automated brush system Brush Arms shall be of Type 316 Stainless Steel and custom designed and installed. A factory service technician shall be on site to observe and advise the installation of the brush arms to allow for cleaning all aforementioned surfaces and allow for the following:
 - A. Flexibility to clean effluent surfaces within a plus or minus 4-inch radial variance (specifically: Clarifier walls, weirs, baffle).
 - B. To allow Brush Holder to be adjusted telescopically so that a maximum number of Brush Arm adjustments are possible.
 - C. To have opposite the Mainframe end, a Brush Holder attachment allowing for the insertion of a brush.
 - D. To have a means of biasing the arm to the Mainframe so as to provide sufficient force to remove algae and debris.

PART 6 - BRUSHES

6-01 Brushes shall be provided that slip easily into the Brush Holder and provide the cleaning means necessary to remove algae and debris from their respective surfaces.

- 6-02 Brush construction shall be as follows:
 - A. Brush backing shall be of durable plastic able to withstand continuous exposure to sunlight, seasonal temperature changes and the corrosive elements found in wastewater.
 - B. Brush bristles shall be polypropylene with adequate trim length, density, and stiffness for extended continuous use.
 - C. Brushes shall be cut and shaped appropriately so as to clean their respective surfaces without binding.
- 6-03 Replacement Brushes shall be stocked and provided by the manufacturer to the exact dimensions needed. Average Brush life shall be eight months. A complete set of brushes for one clarifier shall be included for spare parts.

PART 7 - BRUSH BRIDGE

- 7-01 Provides the automated brush system Launder Brush Assembly a "Bridge" over the effluent hole on which to travel.
- 7-02 The Brush Bridge shall be constructed entirely out of Type 316 Stainless Steel.

PART 8 - QUALITY ASSURANCE/EXPERIENCE QUALIFICATION

- 8-01 Manufacturer of Automated Cleaning Brush System shall have a minimum of three (3) years installation experience and a minimum of 25 units in operation.
- 8-02 Qualifications of manufacturer: Products used in the work specified shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production.
- 8-03 Qualifications of factory service technicians: Use adequate numbers of skilled workman who are factory trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work specified.
- 8-04 Basis of acceptance: The manufacturer's recommended installation procedures, when approved by the Contracting Officer, along with these specifications and all other general contract terms will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

DIVISION 15 - MECHANICAL

SECTION 15384

SCREW PUMP EQUIPMENT

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SECTION 15384

SCREW PUMP EQUIPMENT

PART 1 - GENERAL

1-01 SUMMARY

A. The CONTRACTOR shall furnish, install and place in satisfactory operating condition open screw pump assemblies and appurtenances as shown on the Drawings and described in the Specifications.

B. Related Sections

1. General Conditions, Supplementary Conditions, and General Requirements sections apply to work of this Section.

1-02 REFERENCES

- A. American Institute of Steel Construction (AISC)
- B. American Society of Testing and Materials (ASTM)
- C. American Society of Civil Contracting Officers (ASCE)
- D. American Welding Society (AWS)
- E. Steel Structures Painting Council (SSPC)

1-03 SYSTEM DESCRIPTION

A. Each screw pump shall be furnished complete with steel spiral flighted screw, upper stub shafts, lower journal, upper and lower support bearings, flow deflection plates, gear reducer, V-belts and sheaves, drive motor, automatic lower bearing lubrication system, and all necessary anchorage parts.

B. Design parameters for each unit:

1.	Number of Pumps	3
2.	Pump Capacity, gal/min	1,389
3.	Lift, feet	11.23
4.	Pump Diameter, inches	36
5.	Number of Flights	2
6.	Flight Thickness, inches	0.25
7.	Torque Tube Diameter, inches	18
8.	Torque Tube Wall Thickness, inches	0.375
9.	Maximum Rotational Speed, rev/min	40.5
10.	Minimum Gear Reducer Torque Rating inch-LB	12,610
11.	Motor Size, hp	7.5
12.	Angle of Inclination	38°
13.	Minimum Lower Bearing Diameter, inches	3
14.	Minimum Upper Bearing Diameter, inches	4.5

1-04 SUBMITTALS

- A. The following information shall be submitted in accordance with Section 01330 Submittal Procedures.
 - 1. Complete description of all materials.
 - 2. Certified shop and installation Drawings showing all details of construction, dimensions, and anchor bolt locations.
 - 3. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 4. A complete bill of materials.
 - 5. The weight(s) of each component.
 - 6. Description of surface preparation and shop painting of components and accessories.
 - 7. Electrical and controls requirements, if any.
- B. In the event it is not possible to conform with certain details of the Specifications, describe completely all non-conforming aspects.

1-05 QUALITY ASSURANCE

A. In order to assure uniform quality, ease of maintenance and minimal parts storage, it is the intent of these Specifications that all equipment called for under this Section shall be supplied by a single manufacturer. The equipment manufacturer shall, in addition to the CONTRACTOR, assume the responsibility for proper installation and functioning of the equipment.

B. The Contract Documents represent the minimum acceptable standards for the screw pump equipment for this project. All equipment shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. If not named, equipment which is a "standard product" with that manufacturer shall be modified, redesigned from the standard mode, and shall be furnished with special features, accessories, materials of construction or finishes as may be necessary too conform to the quality mandated by the technical and performance requirements of the specifications.

PART 2 - PRODUCTS

2-01 MANUFACTURER

A. The screw pump assemblies shall be Model 36-2-7.5 as manufactured by USFilter, Zimpro Products or approved equal.

2-02 SPIRAL SCREW

- A. Spiral screw shall be fabricated of ASTM A36 steel. Each spiral screw shall have an outside diameter as noted in paragraph 1.03.B.4. with the number of flights as noted in paragraph 1.03.B.5. Flights shall be die formed and shall have a minimum thickness as noted in paragraph 1.03.B.6. Flights shall be helical shaped and continuously welded on both sides of the torque tube. All flight butt welds shall also be continuously welded on both sides.
- B. Each torque tube shall have a minimum diameter as noted in paragraph 1.03.B.7. with a minimum wall thickness as noted in paragraph 1.03.B.8. so the stress in the torque tube shall not be greater than the 2,800 psi. Calculations for stress and bearing loads shall be based on the dead weight of the screw. Decreased loading from buoyancy effects and added stiffness due to the flights shall not be considered in the design calculations.
- C. The torque tube shall be sealed water tight with a welded steel plate at each end. All surfaces of the end plates mating with the bolted stub shafts shall be finish machined while the pump is supported between centers in a lathe after welding to the support tube and after all flight welding is complete to assure alignment and parallelism.
- D. A solid steel upper drive shaft and lower sleeve bearing and journal shall be fitted with machined, indexed flanges.
- E. The screw shall be placed in a lathe and the flights shall be ground to a true radius.

2-03 LOWER BEARING ASSEMBLY

A. The lower bearing assembly shall include a heavy weight fabricated cam type base welded to a fabricated steel housing. The bronze bearing is pressed into

- the machined shaft and flange. The bronze sleeve bearing shall have a minimum diameter as provided in paragraph 1.03.B.13.
- B. The bronze sleeve shall have a ratio of the length of the sleeve bearing to the diameter of the sleeve bearing not to exceed 1.5:1. The load pressure generated by the screw pump body acting on the sleeve bearing shall not exceed 150 psi.
- C. The grease access and exit ports shall be located on the side of the bearing housing. The grease shall enter the lower bearing on the opposite end of the bronze bushing that grease exits the bearing, thereby forcing grease across the entire bronze bushing.
- D. Bearing assemblies shall be supplied with a split non-rotating shield installed on the fixed bearing housing.
- E. Bearing assemblies shall accommodate thermal expansion and contraction of the screw within the bearing housing on fully lubricated surfaces not subject to corrosion or seizure.
- F. The bearing assembly shall be removable for maintenance purposes without disturbing the screw pump body. To ensure proper installation, the bearing shall include a machined index fit.

2-04 UPPER BEARING ASSEMBLY

- A. The upper stub shaft shall extend through a grease lubricated upper bearing assembly which shall consist of a split housing fitted with dual bearings, lower spring loaded lip seal, bearing spacer and upper spring loaded lip seal. The minimum diameter of this bearing is as stated in paragraph 1.03.B.14.
- B. All of the thrust load from the pump shall be carried by a spherical roller thrust-type bearing assembly and the upper screw pump radial load shall be carried by a spherical roller bearing. A single dual-purpose bearing will not be acceptable.
- C. The two bearings (radial and thrust) shall be positioned in the bearing housing so that the pressure center of the thrust bearing and radial bearing intersects the axis of the screw at the same point to provide true self-alignment in all planes.
- D. Upper stub shaft shall be threaded to accept a lock nut, which will transfer the thrust load from the shaft to the upper bearing. The means of fastening the stub shaft to the upper bearing must permit assembly and disassembly in the field. The use of grooves and split locking collars which are not field replaceable will not be accepted for this project.
- E. Both radial and thrust bearings shall be rated at a minimum of 500,000 hours AFBMA L10 theoretical design life, based on the dead weight of the screw.

F. A split bearing housing shall be provided to allow removal of the cover for inspection of the bearings without removal of the stub shaft or the entire bearing assembly.

2-05 DRIVE ASSEMBLY

- A. The drive assembly shall be designed and constructed for a maximum screw rotational speed as noted in paragraph 1.03.B.9. The drive assembly shall consist of a shaft-mounted gear reducer, belts and sheaves and motor.
- B. A shaft-mounted, double-reduction reducer in a cast iron housing with alloy steel high hardness helical gearing, positive splash-type lubrication and double lip oil seals, shall be keyed to the screw pump stub shaft. Gear reducer shall be designed in accordance with the latest AGMA standards.
- C. The screw pump stub shaft shall be supported by the upper bearing and extended through the reducer hollow bore and centered and held firmly in place by tapered bushings on each side of the reducer. Use of set screws and collar to lock gear reducer to shaft will not be acceptable.
- D. Gear reducer shall be designed with a service factor of not less than 1.5 based on the torque requirements of the screw or 1.0 based on the motor horsepower, whichever is greater. Gear reducer shall have a minimum torque rating as noted in paragraph 1.03.B. 10.
- E. Reducer shall be held in position by a torque arm and torque arm bracket. Torque arm bracket shall be fastened with cast-in-place anchors. Expansion anchors will not be acceptable.
- F. A visual oil level gauge and oil filler tube for the reducer shall be mounted on the reducer.
- G. A backstop shall be provided with the reducer to prevent reverse rotation of the screw.

2-06 BELTS AND SHEAVES

- A. Power transmission from the motor to the reducer shall be by means of a set of V-belts and sheaves. Belts shall be designed with a 1.25 service factor based on full motor horsepower. The belts shall be designed as the weakest link in the drive system, providing a means of protection for other drive components.
- B. Sheaves shall be two section units for both drive and driven sheaves and shall consist of a tapered split shaft bushing with three tapped holes to which the sheave is attached by three cap screws. Changing sheaves shall not require a wheel puller.
- C. Belts and sheaves shall be covered with a fabricated steel belt guard. All guards shall be constructed in accordance with OSHA standards

2-07 MOTOR

- A. Each unit shall be driven by an 1,800 rpm, 3 phase, 60 Hertz, 480 volt, horizontal, ball bearing, continuous duty, constant speed, Design B, normal starting torque, totally enclosed fan cooled foot-mounted motor with leads to gasketed conduit box for outdoor operation.
- B. Motor horsepower shall be as noted in paragraph 1.03.B.11.
- C. Motor shall be mounted on a fabricated steel plate, which provides adjustment of belt slack.

2-08 DEFLECTION PLATES

- A. A flow deflection plate shall be provided to curve around the upper section on the uptake side of the screw to deflect the liquid as the screw rotates.
- B. The flow deflection plate shall be fabricated of not less than 1/8-inch steel plate complete with stiffeners where required and anchors at not more than 2-foot centers at the bottom edge.
- C. The deflection plate top edge shall have adjustable anchors at not more than 8-foot centers.

2-09 AUTOMATIC LUBRICATION SYSTEM

- A. Each screw pump shall be furnished with a positive pressure, automatic lubrication pump and 3/8-inch minimum diameter stainless steel grease line.
- B. The automatic lubrication pump shall provide grease lubricant to the lower bearing assembly.
- C. Each lubrication pump shall be adjustable and shall provide 6 to 17 ounces of grease per day. Grease reservoir shall hold a minimum of 7 liters of lubricant.
- D. The lubricant pump shall consist of an eccentric piston pumping element, a check valve and have a one-third (1/3) horsepower, TENV, ball bearing, 480 volt, 60 Hz, 3 phase, gear motor connected to the lubricator by a flexible coupling.
- E. A centrifugal switch shall be furnished as an integral component of the grease pump and interlocked with the screw pump drive system. When the screw pump is required to operate, the lubrication pump motor shall switch on. As the lubrication pump motor reaches full speed, the centrifugal switch shall close, energizing the screw pump drive motor. If the grease pump motor stops the centrifugal switch shall open, de-energizing the screw pump drive motor. Centrifugal switch shall be rated for not less than 3 amps at 120 VAC. resistive.

F. The lubrication system shall be factory assembled on a steel base plate. The coupling shall have a removable metal coupling guard in accordance with OSHA standards.

2-10 GROUTING MATERIALS

- A. Equipment manufacturer shall furnish a radius screed for the CONTRACTOR to place the finishing grout in the trough with the screw.
- B. Equipment manufacturer shall loan to the CONTRACTOR additional sheave(s) and belts as required to operate the screw at a reduced speed for grouting the trough with the screw pump drive

2-11 ANCHOR BOLTS

- A. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to securely anchor each item of equipment. Anchor bolts, hex nuts, and washers shall be 316 stainless steel unless noted otherwise. Anchor bolts shall be L-type embedded. Expansion-type anchors will not be acceptable.
- B. Anchor bolts shall be set by the CONTRACTOR as per manufacturer submittals. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout.

2-12 SHOP SURFACE PREPARATION AND PAINTING

- A. All fabricated carbon steel or cast iron components for submerged service shall be solvent-cleaned SSPC-SP1 followed by a near-white blast cleaning SSPC-SP10 and given a 3 mil dry film thickness coat of Tnemec 69 Hi-Build Epoxoline Primer.
- B. All fabricated carbon steel or cast iron components for non-submerged service shall be solvent-cleaned SSPC-SP1 followed by a commercial blast cleaning SSPC-SP6 and given a 3 mil dry film thickness coat of Tnemec 69 Hi-Build Epoxoline Primer.
- C. Electric motors, speed reducers, and other self-contained or enclosed components shall be supplied with the manufacturer's standard finish coating.
- D. Apply rust preventative compound to all machined, polished, and nonferrous surfaces which are not to be painted.

2-13 SOURCE QUALITY CONTROL

A. All structural steel components shall be fabricated in the United States and shall conform to the requirements of the "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" published by the American

- Institute of Steel Construction. Except where specifically indicated otherwise, all plates and structural members shall have a minimum thickness of ¼-inch.
- B. The equipment manufacturers shop welds and welding procedures shall be in accordance with the requirements of the latest edition of ANSAWS D1. 1 "Structural Welding Code Steel" published by the American Welding Society.

2-14 MORTAR

- A. Type S mortar shall be 1 part Portland cement, 1/2 part hydrated lime or lime putty and 3 parts sand or 1/2 part Portland cement, 1 part masonry cement and 2-3/4 parts sand.
- B. Fine grout shall be one part Portland cement, 1/10 part hydrated lime or lime putty, and three pars sand, or one part masonry and 2 3/4 parts sand.

PART 3 - EXECUTION

3-01 FIELD PREPARATION AND PAINTING

- A. Finish painting and field preparation shall be performed as specified in Section
- B. The CONTRACTOR shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site.
- C. Prior to the assembly all stainless steel bolts and nut threads shall be coated with a non-seizing compound by the CONTRACTOR.

3-02 INSTALLATION

- A. The manufacturer shall schedule two (2) trip to the project site for start-up assistance and inspection of installed equipment for proper operation as noted in Paragraphs 3.02.B.
- B. The equipment manufacturer shall furnish a qualified service representative for a minimum of 3 man-days (up to 24 hours) to inspect the equipment and to supervise field testing and startup for the CONTRACTOR.
- C. The manufacturer shall maintain staff of qualified service representatives at a facility located in the United States. These representatives shall be full time employee's of the manufacturer that actually fabricates the screw pump. Employee's of a company representing the manufacturer or re-selling another manufacturer's equipment do not qualify.

3-03 OPERATOR TRAINING

A. Provide operator training for operating personnel after the system is operational. Training shall take place while manufacturer's representative is at the job site for equipment inspection.

DIVISION 15 - MECHANICAL

SECTION 15386

GRIT REMOVAL SYSTEM

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SECTION 15386

GRIT REMOVAL SYSTEM

PART 1 - GENERAL

1-01 DESCRIPTION OF WORK

- A. The contractor shall furnish and install one Grit Chamber in accordance with the drawings. Each grit chamber shall be complete with the following equipment: gear motor, gear head, air bell, propeller drive tube, axial flow propeller, grit removal pump and auxiliary equipment as specified herein.
- B. The grit removal unit shall have less than 1/4" head loss and shall be capable of removing grit from raw waste or process water and depositing the grit in a storage dumpster. No moving parts subject to wear or stoppage shall be below the water surface. An integral grit transporting means shall be provided to transport the grit from the storage hopper to the disposal means. To minimize the possibility of clogging, all internal openings in the piping to the grit pumping device as well as the grit pumping device shall be large enough to pass a 4" sphere. No bends or elbows will be allowed in the piping on the suction side of the grit pump. All drives, lubrication and bearings shall be readily accessible from walkways above the operating water level. To minimize the possibility of organic capture, the floor of the grit separation chamber shall be flat and there shall be no greater than a 3" opening for grit to pass through to the storage hopper. Sloping floors in the upper chamber will not be allowed due to reduced grit removal efficiency and extra construction costs. The grit chamber shall be similar or equal to that manufactured by Smith & Loveless*, Inc., Lenexa, Kansas.
- C. An influent baffle or equivalent and inlet coanda ramp shall be provided to enhance the coanda effect and direct the grit downward to the bottom of the separation chamber as well as enhance chamber flow patterns:
- D. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.

1-02 CONDITIONS OF OPERATION

- A. The grit removal device shall be capable of removing the following at the specified hydraulic peak flow rate, and no decrease in efficiency will be allowed at flows less than this design rate.
 - o 95% of the grit greater than 50 mesh in size,
 - o 85% of the grit greater than 70 but less than 50 mesh in size, and
 - o 65% of the grit greater than 100 but less than 70 mesh in size.
- B. The grit chamber shall operate on the vortex principle. The above performance has

been proven in full scale field testing of at least 35 installations utilizing certified grit removal efficiency test procedures as performed by qualified, factory payroll personnel who have at least one year experience performing the test.

- C. To maximize grit removal efficiency, the grit chamber hydraulics shall incorporate a toroidal flow path enhanced by a slow vortex. Grit chambers incorporating the gravity principle will not be acceptable due to the turbulence in the flow, which prevents gravity settling from being effective and due to the extra area needed for settling fine grit. Aerated grit chambers, including those incorporating conventional settling criteria, are also specifically unacceptable.
- D. To ensure the efficient transport of the grit and simultaneous lifting and discharge of the organic material, the bottom of the upper chamber covering the storage hopper shall be constructed of structural grade steel plate, free from rotation, and shall be flat.
- E. The grit moving across the bottom of the chamber shall be hydraulically scoured as the propeller blades, moving within 6" of the grit, pass over the moving grit and cause hydraulic currents to lift up the organics. The grit scouring intensity shall be adjustable. Propellers running with a center line greater than 8" from the bottom of the chamber will not be acceptable. The grit shall pass from the removal chamber through an opening in the transition plate and drop into a grit storage hopper.
- F. The flow in the removal chamber shall travel between the inlet and the outlet a minimum 360°, providing maximum travel of the liquid for effective grit removal.
- G. The Grit Chamber shall handle all flows equal to or less than a hydraulic peak flow of 16 MGD. The influent flume, transporting the liquid waste to the grit chamber, shall be of the size and shape shown on the contract drawings to assure that grit does not settle in the inlet flume and to provide for proper operation of the grit chamber.

PART 2 - PRODUCTS

2-01 MECHANICAL DRIVE

- A. The grit removal unit shall have an axial flow propeller connected by a drive tube through gearing to a 3 phase, 60 cycle, 480 volt, totally enclosed helical gear motor. The minimum rated horsepower of the motor shall be 1.5 BHP.
- B. The drive tube shall be driven by a large, totally enclosed combination spur gear and turntable bearing. The maximum output speed of the drive shall be 21 RPM. Pinions and gears shall be high quality steel, machined and hardened for high strength and long wear. Propeller blades shall be tapered, with generously rounded leading edge to reduce energy consumption and prevent foreign material from fouling the propeller.
- C. A pinion mounted on the output shaft of the helical gear motor shall drive a large spur tooth bull gear enclosed in a heavy cast iron case. The spur gear pinion shall be cut from heat treated steel. The bull gear shall rotate with a minimum 21" diameter turntable bearing for durability and stability. The pinion and bull gear shall have a

service factor of 5.0 or greater at standard operating speeds.

- D. All bearings of the drive unit, including the motor, shall have a minimum B-10 bearing life of 50,000 hours, except for the 21" diameter turntable bearing supporting the propeller assembly which shall have a minimum B-10 life of 20 years.
- E. The bull gearbox shall be specifically designed for this service. It shall have an opening for the 10-3/4" diameter torque tube driving the propeller. The gearbox shall be sealed and the bottom opening shall have an air bell around the torque tube to prevent water from entering the gearbox in case of flooding. The top of the gearbox shall have a bolted flanged connection for the grit discharge pipe. Clarifier drives, which are modified to meet the higher propeller speed, specifically will not be acceptable. The drive motor shall have normal starting torque and low starting current. The motor shall not be overloaded beyond the nameplate rating under any normal conditions encountered.

2-02 GRIT STORAGE HOPPER

- A. A grit storage hopper with a 60° sloped bottom shall be provided. The effective storage volume shall be a minimum of 100 cubic feet. To prevent squatty storage chambers the maximum diameter shall be 5'-0". The minimum depth shall be 6'-10". This is to allow for adequate volume for grit pile expansion if backwashing is performed plus allow adequate storage to prevent excessive numbers of grit removal cycles and grit handling equipment wear.
- B. As an integral part of the equipment installation, the Manufacturer shall supply a floor plate to cover the storage hopper. The plate shall consist of two sections with lifting slots to allow access to the storage area. Attaching this plate as part of the rotating assembly will not be allowed.

2-03 GRIT PUMP – TOP MOUNTED

- A. The Grit Pump shall be a 4" vertical, close-coupled, vacuum primed type with curved 5-vane flow inducer completely out of the flow path between the pump inlet and discharge connection, so that the grit pumped is not required to pass through the impeller. All internal clearances shall provide for the passage of a 4" spherical solid to preclude clogging of the pump and suction line. The pump shall be designed to be inline mounted directly to a flange on top of the straight 4" suction line. The suction line shall be vertical, passing up through the Grit Chamber, drive, to prevent accumulated grit from flowing into the suction pipe during idle periods and clogging the suction line. The pump shall be vertical, for easy removal of the motor and impeller, to facilitate maintenance of the suction line by providing a straight path to any potential blockage.
- B. The pump shall be of Ni-Hard construction, with Ni-Hard impeller, and especially designed for the use of mechanical seals and vacuum priming. Self-priming type pumps are specifically not acceptable.
- C. In order to minimize seal wear caused by lineal movement of the shaft, the shaft

bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing. To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of 1-7/8". The dimension from the lower bearing to the top of the impeller hub shall not exceed 6".

- D. The bottom bearing of the motor shall be locked in place and designed to handle all thrust loads and the necessary radial load. The upper bearing shall be free to move up and down and thus carry only radial load. This movement allows for thermal expansion of the shaft.
- E. The shaft shall be solid stainless steel through the mechanical seal to eliminate corrosion and abrasive rust particles. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified 1-7/8" minimum diameter. Carbon steel shafts are not acceptable.
- F. The impeller shall produce a turbine like flow pattern within the casing, generating flow. To prevent grit from entering the seal area, all impellers less than full diameter shall be trimmed with the back shroud remaining full diameter so that a minimum clearance from shroud to casing is maintained. Both the end of the shaft and the bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft.
- G. The pump shall be specifically designed for vacuum priming service and have been in this service for a period of at least 10 years. The pump shall have an adapter providing a large water reservoir above the impeller to provide for positive exclusion of air from the impeller. The seal shall be inside this area to assure lubrication and grit shall be excluded from this area by a full size impeller shroud. Pumps, which do not use hollow priming adapters for positive lubrication of the seal, will not be acceptable.
- H. The pump shall be arranged so that the complete rotating element can easily be removed from the casing without disconnecting the electrical wiring or disassembling the motor, impeller, backhead or seal.
- I. The pump shall be sealed against leakage by a single mechanical seal, constructed so as to be automatically drained and automatically primed each time the pump is drained and primed. Water which lubricates the mechanical seal shall be automatically drained from around the seal if the pump loses prime; in order to allow both the pump and the seal to be drained, thereby preventing freezing and breakage of the seal during power outages in sub-freezing temperatures.
- J. The seal shall be of carbon and ceramic materials with the mating surface lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless steel spring.
- K. The Grit Pump shall be capable of delivering 250 GPM against a total dynamic head of 36'. The maximum allowable speed shall be 1760 RPM. The minimum rated horsepower of the Grit Pump motor shall be 10 BHP.

- L. The pump motor shall be vertical, solid shaft, TEFC NEMA P-base, squirrel cage induction type, suitable for 3 phase, 60 cycle, 480 volt electric current. It shall have Class F insulation, but the motor shall have Class B temperature limits. The motor shall have normal starting torque and low starting current, as specified for NEMA Design B characteristics. It shall have a 1.15 service factor.
- M. The motor pump shaft shall be centered, in relation to the motor base, within .005". The shaft run-out shall be limited to .003".
- N. A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant.
- O. The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor.

MINIMUM REQUIREMENTS

• Shaft through seal: 1-7/8" Diameter, Solid Stainless Steel

Lower bearing to impeller distance: 6" Maximum
 Shaft run-out: 0.003" Maximum

Shaft end play: Limited to bearing shake

• Shaft to motor base: 0.005" Maximum

Impeller to shaft
 Tapered

• Impeller:

Type
 Material
 Shroud
 Recessed 5-Vane Turbo
 Ni-Hard - High nickel iron
 Untrimmed - Full diameter

• Seal housing: Bronze

Low pressure priming source: Behind impeller
 Fronthead to casing: One piece
 Backhead & motor adapter: One piece
 Upper bearing: Axially free
 Lower bearing: Locked in place

Motor insulation: Class F
 Motor temperature rise: Class B
 Motor service factor: 1.15

P. Pumps will only be considered if all of the above requirements are met as a minimum. These requirements are specified for long service life and ease of operator maintenance. Deviations from the grit pump specifications will be cause for rejection.

2-04 VACUUM PRIMING SYSTEM

A. The vacuum priming system shall be located adjacent to the Grit Pump in a weatherproof enclosure mounted on the drive unit for the Grit Chamber. It shall be complete with vacuum pump, vacuum control solenoid valve, prime level sensing probe, heater, and a float operated check valve installed in the system ahead of the vacuum pump to prevent liquid from entering the vacuum pump. The float-operated

- check valve shall have a transparent body for visual inspection of the liquid level and shall be automatically drained when the vacuum pump shuts off.
- B. The vacuum pump shall have corrosion resistant internal components. It shall be capable of priming the Grit Pump and grit removal piping in not greater than 60 seconds under rated static lift conditions.
- C. The priming system shall automatically provide positive lubrication of the mechanical seal each time the Grit Pump is primed. To prevent excessive stoppage due to grit accumulation, no passageway in the priming system through which grit must pass shall be smaller than the equivalent of a 2-1/2" opening. Priming from high-pressure (gauge) connections will not be acceptable.

2-05 LIFTING STANCHION

A. A stanchion with lifting arm shall be provided to lift the Grit Pump for disassembly. The lifting arm shall have a hook over the center of the motor to support a hoist provided by the Owner. Installation shall be as detailed in the contract drawings. The lifter shall be designed for a 1,000 lb. lifting load.

2-06 ELECTRICAL CONTROLS FOR AUTOMATIC GRIT REMOVAL

- A. The electrical control equipment shall be mounted in a NEMA 4X stainless steel enclosure with removable access cover and dead-front operation. Molded-case thermal-magnetic circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits.
- B. Magnetic across-the-line starters with overload coils for each phase shall be provided for the Grit Pump motor and drive motor for the propeller drive unit. Each single-phase auxiliary motor shall be equipped with an over-current protection device, in addition to the branch circuit breaker, or shall be impedance protected. All switches shall be labeled and a coded wiring diagram shall be provided.
- C. An On/Off selector switch shall be provided to operate the propeller drive motor starter.
- D. To control the operation of the Grit Pump, a manual momentary-off-automatic selector switch shall be provided. In the automatic position, control shall be by a time clock with manual selector switch to override the timer and initiate the pumping cycle. A 24-hour, 96-position time clock shall be provided. The 24-hour timer contacts shall operate a 0-30 minute pump timer and a 0-30 minute priming timer. All timers shall be provided within the control cabinet enclosure.
- E. A pneumatically controlled discharge pinch valve shall be furnished for installation in the vertical discharge piping run, and the controls shall be located in the vacuum priming control panel. The controls shall include an oil-less air compressor and solenoid valve. The operation of the discharge pinch valve shall be tied into the cycle timer and electrode, so as to be fully automatic.

2-07 PRIME FAILURE ALARM

- A. A "prime failure" alarm shall be initiated if pump does not prime before time set on the priming timer. Interlocks shall be provided to prevent the Grit Pump from operating if the pump is not primed.
- B. All necessary capacitors, relays, diodes, etc., shall be provided as shown on the schematic diagram. In order to ensure continuity of operation, the Manufacturer of the Grit Chamber shall provide these controls, and the full opening pneumatically controlled pinch valve for installation on the grit discharge line as shown on the drawings.

2-08 CONTROL TRANSFORMER

A. A properly sized insulating type control transformer shall be provided by the controls Manufacturer to supply power for controls and auxiliary devices necessary to semi-automatic operation. The control transformer shall have 208/230/460 volt AC primary, 120 volt AC secondary, Class F insulation; with temperature rise not to exceed 115° C above a 40° C ambient.

2-09 GRIT CONCENTRATOR

- A. A 6", 250 GPM second stage Grit Concentrator shall be provided as shown on the drawings for secondary treatment of organics and secondary grit dewatering. The Grit Concentrator shall operate on the constant rate vortex principle. Design shall be such that a small volume of water and the grit will discharge at the bottom for final dewatering and ultimate disposal of the grit.
- B. As a minimum, 93 to 94 percent of the water pumped to the Grit Concentrator and 95 to 96 percent of the residual organic material shall flow out the top and be returned to the inlet channel to the Grit Chamber. The unit shall be capable of intermittent operation with minimal variation in removal efficiency. There shall be less than 5% putrescible material in the recovered grit from the underflow.
- C. The Grit Concentrator shall be constructed of Ni-hard, with a minimum thickness of 1/2" and 1-1/4" in high wear areas. Inlet and outlet connections shall be as shown on the drawings. The Grit Concentrator shall be provided by the Manufacturer of the Grit Chamber, for installation by the contractor. The operating range shall be compatible with the total grit removal system as described herein.

2-10 GRIT SCREW CONVEYOR WITH PARALLEL PLATE SEPARATOR

A. The Grit Screw Conveyor shall be constructed of steel with an inlet hopper to receive the mixture of water and grit. The hopper shall be equipped with an energy dissipation zone to prevent turbulence in the remaining portion of the hopper. The hopper shall have parallel plates located in the settling zone to improve retention of the fine grit. An overflow weir trough shall be provided to return the water to the system. The conveyor shall be freestanding with support legs to hold the conveyor at

- an angle of approximately 22°. The discharge shall be 8" diameter, plain-end steel pipe. The drive assembly shall be located at the discharge end.
- B. The Grit Screw Conveyor shall have an open, 3/16" steel U-trough. The screw shall be 9" in diameter. The conveyor shall be 15' in length, with overall dimensions as shown on the drawing. The hopper shall have a 4" full-length outlet weir trough to minimize the overflow rate and carry over of the fine grit. The projected separator plate settling area shall be a minimum of 15.1 sq. ft.
- C. The screw shall run on anti-friction bearings at the outlet end, and a bronze bushing at the inlet end. The inlet end shaft bushing shall be capable of being greased. The inlet end shall have two 2" drains. Clearance between the legs and the discharge outlet shall be as shown on the drawing.
- D. The drive to the conveyor shall be a belt driven, shaft mounted helical gear reducer. The motor shall be 1 HP, TEFC, 3-phase, 60 Hertz, 460 volt. The screw speed shall be 9 RPM. The drive shall be mounted on a plate at the discharge end and the plate shall be bolted to the flanges on the trough.
- E. An expanded aluminum flattened mesh cover shall be provided over the hopper and trough openings. The 30" x 60" opening over the hopper shall not be covered.

2-11 CORROSION PROTECTION

- A. All structural steel surfaces shall be factory blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Surface preparation shall comply with SSPC-SP6 specifications. Immediately following cleaning, a single 3-mil dry film thickness of red oxide primer shall be factory applied prior to shipment.
- B. Stainless steel, aluminum and other corrosion-resistant surfaces shall not be coated. Carbon steel surfaces, not otherwise protected, shall be coated with a suitable non-hardening rust preventative compound. Auxiliary components, such as the grit pump, gear motor, etc., shall be furnished with the original Manufacturer's coating.
- C. Final touch-up and finish coating of the primed surfaces shall be the responsibility of the purchasing contractor, and shall be accomplished in the field. Finish coating shall be a high-solids epoxy, applied in one coat to a dry film thickness of 6 mils. The purchasing contractor shall be responsible for ensuring that the finish coating is compatible with the above specified primer.

2-12 MANUFACTURING QUALITY

A. The specified Manufacturer markets, designs, fabricates and manufactures the grit chamber equipment at its own U. S. facility. The Manufacturer shall have on staff registered Professional Engineers, both in process and design. This would be for providing current capabilities in these areas as well as future capabilities after the equipment is installed and operating.

PART 3 - EXECUTION

3-01 INSTALLATION AND OPERATING INSTRUCTIONS

A. Installation and operation shall be in accordance with instructions provided by the Manufacturer.

3-02 STARTUP

A. The Manufacturer shall provide the services of a factory-trained representative for a maximum period of 3 days on-site to assist with the initial startup, and to instruct the Owner's operating personnel in the operation and maintenance of the equipment.

3-03 WARRANTY

- A. The Manufacturer of the equipment shall warrant for one (1) year from date of startup, not to exceed eighteen (18) months from date of shipment, that all equipment he provides will be free from defects in material and workmanship.
- B. In the event a component fails to perform as specified, or is proven defective in service during the warranty period, the Manufacturer shall repair or replace, at his discretion, such defective part. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components. After startup service has been performed, the labor to replace accessory items shall be the responsibility of others.
- C. The repair or replacement of those items normally consumed in service such as seals, grease, light bulbs, etc., shall be considered as part of routine maintenance and upkeep.
- D. It is not intended that the Manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material, workmanship or delays in delivery, replacement or otherwise.

3-04 OPERATIONS AND MAINTENANCE MANUAL

A. Contractor shall provide to the Contracting Officer six (6) copies of an Operations and Maintenance Manual for the equipment. The manual shall contain all detailed care, use and maintenance instructions.

DIVISION 15 – MECHANICAL

SECTION 15390

AERATION BASIN SPECIFICATIONS

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SECTION 15390

AERATION BASIN SPECIFICATIONS

PART 1 - GENERAL

1-01 SCOPE

A. Description of Work

- 1. Provide all labor, material and equipment to furnish and install the Aeration Equipment as specified herein.
- 2. This specification covers the general requirements for the design, fabrication and installation of one (1) aeration basin.
- B. Work and Components Included (But Not Limited To)
 - 1. The Equipment Manufacturer shall furnish the items listed below:
 - a. Aeration disc assemblies with hardware
 - b. Solid shaft assemblies
 - c. Shaft-mounted drive assemblies
 - d. Pillow block roller bearings with bearing base plates
 - e. Flexible shaft couplings
 - f. Splash shields and supports
 - g. Stainless steel anchor bolts
 - 2. Like items of equipment specified herein shall be the end products of one manufacturer in order to achieve standardization for operation, maintenance, spare parts and manufacturer's service.
 - 3. Manufacturer of aeration basin equipment must co-ordinate with the manufacturer of the clarifier equipment to assure that design criteria as stated in this section are met.

C. Work Not Included

1. The following items are specified under other sections of these specifications:

a.	Concrete and Grout	Section 03300
c.	Metal Fabrication	Section 05500
d.	Paint	Section 09900
e.	Electrical	Section 16000

1-02 QUALIFICATIONS

A. Manufacturer

1. US Filter, Envirex Products, Orbal™ model 650/425-20A or approved equal.

B. Manufacturer's Experience

- 1. The equipment Manufacturer shall have not less than five (5) successful years experience in the design, construction and operation of the type specified at ten (10) different plants.
- 2. The Contracting Officer may require evidence, in the form of operating records, from these plants to substantiate any claims concerning the ability of the equipment to perform as required.

1-03 SUBMITTALS

A. Operating instructions, manuals and shop drawings shall be submitted in accordance with Section 1330.

1-04 EQUIPMENT MANUFACTURER'S SERVICE REPRESENTATIVE

A. Manufacturer's Field Service

1. The Manufacturer's field service technician shall check the installation of the equipment, assist in the start-up, and provide training on the maintenance of the equipment. A minimum of two (2) trips, and a total of two (2) days at site shall be provided.

B. Process training

1. The Manufacturer's process Engineer shall provide process training. The training is conducted 4-6 weeks after the plant has begun receiving wastewater. At that time, a review of the plant analytical and operational data will be reviewed and training provided. Prior to the actual field visit, the manufacturer's process Engineer will be in contact with the plant operators to discuss operational issues including the actual process start-up. The total service shall not be less than one (1) trip and one (1) day at site.

1-05 GUARANTEE AND WARRANTY

A. The equipment shall be guaranteed to meet or exceed the design criteria detailed in Part 1 and Part 2 of this specification.

PART 2 - PRODUCTS

2-01 GENERAL

A. The design and layout shown on the drawings are based on the Manufacturer listed in Section 1.02.A.1.

2-02 EQUIPMENT

A. General

- 1. There shall be provided, as shown on the plans, one (1) complete aeration basin wastewater treatment system.
- 2. The principal structure shall consist of three (3) endless aeration channels arranged in a concentric manner with common intermediate walls. Raw wastewater, after entering the system, shall pass progressively through the aerated channels and then to the final clarifier(s). The raw wastewater may be introduced into any one of the three (3) channels depending upon the operating conditions. Recycled sludge shall be returned to the outer or middle channels. The flow from one aeration channel to another shall be by displacement of the mixed liquor circulating in each channel through submerged ports interconnecting each adjacent aeration channel. The displaced flow shall be equal to the volume of raw waste and recycled sludge introduced into the aeration system.
- 3. The effluent from the final aeration channel shall be controlled by means of a submerged adjustable orifice gate and overflow weir provided by the contractor and shall be, designed to allow a liquid level variation of 12" (300 mm) in the aeration channels with variations in the flow of waste water and recycled sludge.
- 4. The aeration equipment shall consist of ten (10) complete rotary aerator assemblies to span the channels, as shown on the plans. The rotary aerators shall be designed for operation at a controlled disc submergence of 9 (229 mm) to 21 (533 mm) inches, so that the oxygen transfer rate and power requirements can be varied with the flow and treatment requirements.
- 5. Piping shall be installed to allow operation of the outer channel independently or the inner two channels together to treat the incoming wastewater.
- 6. The aeration basin's outer channel shall be capable of operating to promote simultaneous nitrification/denitrification in an anoxic environment.

B. Design Criteria

1. The design loading of the system and effluent requirement shall be the following:

	Loading	Effluent Requirement
BOD ₅	275 mg/l	< 10 mg/l
T.S.S.	229 mg/l	< 30 mg/l
NH ₃ -N	31 mg/l	<2 mg/l

2. The rotary aerator assemblies to be furnished and installed shall be capable of delivering the following quantities of oxygen to each channel at each location as described in the following tables. The oxygen values are measured at Standard Operating Requirements of 68EF (20EC) and 30" (760 mm) Hg.

ROTARY AERATOR ASSEMBLIES DESIGN OXYGEN TRANSFER DELIVERY, lbs. O ₂ /hr (Based on rotational speed of 44 RPM, and 17" disc immersion)							
UNIT	НР		SIDE NNEL	MIDDLE CHANNEL		INNER CHANNEL	
NO.	111	No. of	Delivery	No. of	Delivery	No. of	Delivery
		Disc	lb/O ₂ /hr	Disc	lb/O ₂ /hr	Disc	lb/O ₂ /hr
1-4	25	30	43	0	0	0	0
5-10	50	0	0	30	43	30	43
SUM	400	120	172	180	258	180	258

ROTARY AERATOR ASSEMBLIES DESIGN OXYGEN TRANSFER DELIVERY, lbs. O ₂ /hr (Based on rotational speed of 55 RPM, and 21" disc immersion)							
UNIT	НР		SIDE NNEL	MIDDLE CHANNEL		INNER CHANNEL	
NO.		No. of Disc	Delivery lb/O ₂ /hr	No. of Disc	Delivery lb/O ₂ /hr	No. of Disc	Delivery lb/O ₂ /hr
1-4	25	30	75	0	0	0	0
5-10	50	0	0	30	75	30	75
SUM	400	120	300	180	450	180	450

C. Aeration Discs

- 1. There shall be provided not less than the specified number of circular aeration discs, located as determined by the supplier in order to provide the required oxygen requirements.
- 2. The discs shall be fabricated of 1/2" (13 mm) thick molded plastic compound resistant to any corrosive action of the mixed liquor being aerated. A multiplicity of cavities and raised triangular protrusions shall be provided in the disc to cause entrained air to be dispersed in the mixed liquor.
- 3. The aeration discs shall be firmly attached to the shafting by means of a shaft locating collar. This shaft locating collar shall be an integral part of the aeration discs. To enable the individual discs to be attached, adjusted, or removed from the shafting without disassembling the shafting, discs shall be split into half sections held in position by bolts at the shaft and at the periphery. Bolts and washers shall be stainless steel; nuts shall be brass.
- 4. Contractor shall be required to field install discs, and set disc location along the shaft as required to meet the specifications and the treatment process as determined by manufacturer and the Contracting Officer.
- 5. Whereas the specified disc aerator will give a different power draw and oxygen delivery performance when changing rotation direction from clockwise to counterclockwise, only rotating aerators that show a similar reversibility feature will be considered. The performance variation shall be a 33% increase in oxygen transfer and power draw for one direction over the opposite. Performance variations based upon changes of aerator immersion or rotation speed shall not be allowed as a substitute for this feature.
- 6. The individual discs shall be adjustable to a minimum 6" (150 mm) spacing at any location in the oxidation ditch to provide flexibility in oxygen delivery.
- 7. To maintain a low delivery intensity, the design delivery rate of the aerator shall not exceed 2.5 lbs. O₂/ft of shaft section.
- 8. To provide aerator flexibility, all necessary appurtenances shall be provided with each 50 Hp aerator shaft to allow a maximum delivery rate of 90 lbs. 0₂/hr per shaft section by relocating discs.
- 9. The system shall be capable of maintaining a MLSS concentration of 4,500 mg/l in each of the three channels.

D. Shafting

- 1. Rotor shafting shall be solid 6" (150 mm) 1045 steel, made from ingot, turned and polished. Shaft ends shall be true concentric within 0.008" (0.203 mm) total indicator reading. Shaft end tolerance shall be +0.000" and 0.003" (-0.076 mm).
- 2. The shafting shall be capable of withstanding all dead, live, and radial loads imposed on it. Maximum allowable deflection shall be 0.15 inch per 10 ft. (3.0 m) length of shaft.
- 3. Each shaft section shall be supported by self aligning, pressure grease lubricated, roller bearing pillow blocks set on adjustable anchor plates.
- 4. Bearings located beneath the removable grating shall be provided with grease tubing extensions to the top of the grating.
- 5. The pillow block shall be split and shall have double row tapered bearings and double locking collars. Each locking collar shall have two (2) setscrews. Bonded elastomeric, single lip contract seals shall be provided to insure positive sealing against contaminants. The seal shall be designed for operation in a moisture laden environment and shall seal effectively, even during misalignment. Minimum B-10 bearing life shall be 500,000 hours.

E. Rotor shaft flexible coupling

- 1. Rotor shafts rotated with a common drive assembly shall be separated into sections at the intermediate pillow block support bearings. Sections shall be connected by use of flexible shaft couplings. Couplings shall be adequate to compensate for 0.03" (0.76 mm) parallel shaft misalignment, 0.050" (1.27 mm) angular shaft misalignment, up to 7 degrees (0.122 rad.) torsional flexibility, and shall withstand all of the combined dead, live, torque, and large dynamic radial loads.
- 2. The flexible shaft coupling shall be self aligning, with a nonmetallic elastomer center element, and shall require no oil or grease and shall be maintenance free. These couplings shall be Wood's "Sure-Flex" or approved equal.

F. Drive (Shaftmounted)

1. The drive mechanism for each aerator assembly shall consist of a constant speed motor and a shaftmounted AGMA Class II helical gear reducer sized for 24-hour continuous operation with allowance for moderate shock loads. The motor and reducer shall be fully suitable for outdoor service and exposure to the atmosphere encountered.

- 2. A torque arm shall be provided to hold the reducer in position. Power transmission between the motor and reducer shall be by means of belts and sheaves and the belt drive shall be protected by an OSHA acceptable guard. Motor shall be mounted on an adjustable base to facilitate belt tensioning. Each drive shall be supplied with belts and sheaves to produce aerator speeds of 44 and 55 RPM.
- 3. Motor shall be 25 and 50 HP, TEFC, 1800 RPM, 460V., 3 phase, 60 hz, squirrel cage, induction type with Class F insulation and a 1.15 service factor.

G. Splash Shields

- 1. Splash shields shall be provided to prevent the wetting of bearings and drive units from the disc spray. Shields shall be constructed of 12-gauge-galvanized steel with stainless steel mounting hardware.
- 2. Neoprene seals shall be attached to the splash shields to prevent liquid from moving along the shaft toward the bearings.

H. Rotor Immersion Gauge

1. One (1) rotor immersion gauge shall be provided to indicate disc submergence levels. Gauge will be constructed of 14 ga. anodized aluminum and will include 316 stainless steel mounting hardware.

I. Anchor Bolts

1. All anchor bolts shall be 316 stainless steel and furnished by the Manufacturer and set with proper projection by the Contractor in accordance with approved, certified drawings furnished by the Manufacturer.

J. Painting

- 1. Base plates, shafting shall be blastcleaned then shop primed with one (1) coat of Tnemec #140-1211, Pota-Pox Plus, polyamidoamine epoxy.
- 2. Motors, reducers, belt guards, bearings, couplings shall be painted manufacturer's standard coating.
- 3. Provide balance of painting and surface preparation per PAINT Section 09900.

K. Mortar

1. Type S mortar shall be 1 part Portland cement, 1/2 part hydrated lime or lime putty and 3 parts sand or 1/2 part Portland cement, 1 part masonry cement and 2-3/4 parts sand.

2. Fine grout shall be one part Portland cement, 1/10 part hydrated lime or lime putty, and three pars sand, or one part masonry and 2 3/4 parts sand.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. The Contractor shall install the Aeration Basin System as shown on the drawings.
- B. Equipment shall be installed in accordance with the Manufacturer's recommendations to provide a complete installation.
- C. The Contractor shall level, align shafting, grout beneath bearing base plates, install drives and aeration discs in accordance with the Manufacturer's drawings and installation manual.

3-02 ELECTRICAL CONNECTIONS AND WIRING

A. Wiring and conduits for electrical power, control and instrumentation will be provided by the Electrical Contractor under DIVISION 16 - ELECTRICAL.

3-03 FIELD TESTING - MIXING EFFICIENCY

- A. A field test shall be performed by the Equipment Manufacturer on the installed equipment to verify that a minimum mixing efficiency is maintained. Testing shall consist of the following:
 - 1. Testing shall be performed in each channel at a point specified by the Owner.
 - 2. At each of the above locations, 9 equidistantly spaced points in the channel cross section shall be checked. The average velocity for each cross section shall equal or exceed 1.0 ft/sec (0.30 m/s). The Equipment Manufacturer shall notify the Contracting Officer 10 days in advance of all testing so the Contracting Officer or his representative can be present for all tests. The velocity testing will occur immediately upon filling of the basins to prevent the build-up of stringy material, which may affect the velocity meters.
 - 3. Motor input power shall be measured in the field, at the nearest disconnect switch where access can be gained, using TIF Model KW 220, 3 phase wattmeter. Motor input power shall be converted to motor output power using the motor manufacturer's stated efficiency from the motor test report submitted with the shop drawings.

DIVISION 15 - MECHANICAL

SECTION 15391

LOW PROFILE PACKAGED CASCADE AERATOR

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SECTION 15391 LOW PROFILE PACKAGED CASCADE AERATOR (INSERTION TYPE)

PART 1 - SCOPE

1-01 The contractor shall furnish and install a stationary low profile cascade aerator as shown on plans and specified herein for post aeration.

PART 2 - GENERAL

- 2-01 The post aerator shall be a current, standard product of a manufacturer regularly engaged in the production of such equipment with proven performance test results. The post aerator specified shall be a Low Profile Cascade Aerator Model 2-24-6 by Smallberry Manufacturing, Inc., or approved equal
- 2-02 The unit shall be a rectangular, open channel type, low profile, free flowing aerator with hydraulic loading capacity of 0.25 MGD to 8 MGD.
- 2-03 The aeration equipment shall consist of a plurality of channel dividers with inlet flow control gates and weirs. The inlet weirs shall be for flow control and each shall increase in height from one channel to the next. Each channel shall be provided with a plurality of low head aeration baffles spaced as shown on plans. Each aeration baffle shall be provided with air infusion plates as shown to provide optimum transfer efficiency. All aeration equipment shall be fabricated of type 304 stainless steel and shall include all necessary stainless steel anchor bolts, gaskets and accessories.

PART 3 - MOUNTING

3-01 The low profile cascade aerator shall be fabricated for insertion in a concrete channel as shown on plans. The unit shall be structurally reinforced with standing plate and angle iron cross members for freestanding in the concrete encasement. The unit shall be sealed under the channel dividers and anchored in the concrete channel as directed by the manufactures instructions.

PART 4 - SHOP DRAWINGS

4-01 Six sets of shop drawings shall be provided to the Contracting Officer for approval prior to fabrication and shipment.

PART 5 - GUARANTEE

5-01 The unit shall be guaranteed for twelve (12) months from date of installation against defects in workmanship and materials.

DIVISION 15 - MECHANICAL

SECTION 15392

HYDRAULIC GRINDER WITH ROTATING SCREENS

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SECTION 15392

HYDRAULIC GRINDER WITH ROTATING SCREENS

PART 1 GENERAL

1-01 DESCRIPTION

- A This section of the specification describes the screens, grinders, and the associated motor controllers. The equipment shall be installed as shown on the plans, as recommended by the supplier, and in compliance with all OSHA, local, state, and federal codes and regulations.
- B The number of drum screening system with grinder shall be two. Each screening/grinder system shall include the drums, hydraulic power pack with motor, grinder with hydraulic torque motor, and motor controller.

1-02 QUALITY ASSURANCE

- A Screen drum assemblies, Grinders, and Motor Controllers shall, as applicable, meet the requirements of the following industry standards:
 - 1. American Society for Testing and Materials (ASTM) A 36: Standard Specification for Carbon Steel Plate
 - 2. American Society for Testing and Materials (ASTM) A 536-84: Standard Specification for Ferritic Ductile Iron Castings
 - 3. American Iron and Steel Institute (AISI) 304 Stainless Steel
 - 4. American Iron and Steel Institute (AISI) 4130 Heat Treated Alloy Steel
 - 5. American Iron and Steel Institute (AISI) 4140 Heat Treated Hexagon Steel
 - 6. Cutter Material Hardness: 45-50 Rockwell C
 - 7. National Electrical Manufacturer's Association (NEMA) Standards
 - 8. National Electrical Code (NEC)
 - 9. Underwriters Laboratory (UL and cUL)
- B Qualified suppliers shall have a minimum 5 years experience at manufacturing twoshafted grinding and controlling equipment and a minimum 20 installations at equivalent applications. Supplier shall provide a list of names and dates of installations for verification by the Contracting Officer.

1-03 ACCEPTABLE SUPPLIERS

- A Screen drum assemblies, grinders, and motor controllers shall be supplied by JWC Environmental or Contracting Officer approved equal.
- B The manufacturer shall certify that the unit can be returned for maintenance to the factory or a local repair facility.

1-04 IDENTIFICATION

A Each unit of equipment shall be identified with a corrosion resistant nameplate, securely affixed in a conspicuous place. Nameplate information shall include equipment model number, serial number, supplier's name and location.

1-05 SUBMITTALS

A Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures.

PART 2 PRODUCTS

2-01 SCREEN DRUM ASSEMBLIES

A GENERAL

- 1. Two rotating screen drums shall consist of a helical coil mounted to vertical supports and stub shafts.
- 2. Both rotating drums shall direct all solids toward and into the dual counter-rotating shaft grinder. Drums shall be located on each side of the grinder and shall be driven by the grinder drive mechanism.

B COMPONENTS

1. Screen

a. The screen shall be made of a stainless steel spiral coil drum. The coil stock diameter shall be ¼-inch with ¼-inch spacing.

2. Drum Stub Shafts

a. Drum shafts shall be made of Grade 304 Stainless Steel with a tensile strength of not less than 95,000-psi (654,550-kPa). The shaft diameter shall be a minimum of 1 1/2-inch (38-mm).

3. Drum Support Skeleton

a. The drum support skeleton shall be constructed of Grade 304 Stainless Steel. The support skeleton shall include hubs for mounting of drum stub shafts. Vertical members shall provide support for the coil.

4. Drum Shaft Bearings and Seals

a. The radial and axial loads of the drum shafts shall be borne by four sealed oversize deep-groove ball bearings. The bearings shall be protected by a combination of a replaceable and independent tortuous path device and end face

- mechanical seals. Face materials shall be a minimum of tungsten carbide to tungsten carbide, not requiring an external flush or any type of lubrication.
- b. Products requiring continuous or occasional lubrication or flushing shall not be accepted.
- c. The mechanical seal shall be rated at 90-psi (620-kPa) continuous duty by the seal supplier.
- d. The bearings and seals shall be housed in a replaceable cartridge that supports and aligns the bearings and seals, as well as protects the shafts and end housings.
- e. O-rings shall be made of Buna-N elastomers.
- f. Each seal face shall be locked to provide positive drive on the rotating face and a positive lock on the static face. This positive lock on the seal faces is critical to long seal life in applications where grit or other abrasive materials are present.

2-02 GRINDERS

A GENERAL

- 1. Each grinder shall include guide plate, frame, end housings, covers, shafts, side rails, reducer, motor, cutters, spacers, bearings, and seals.
- 2. The grinder shall be two-shaft design and be capable of continuous operation, processing wet or dry. Bar screens or single shaft devices utilizing a single rotating cutter bar with stationary cutters shall not be acceptable. Grinders designed with cutter and spacer cartridges rather than individual cutters and spacers, shall not be acceptable.
- 3. Two-shaft design shall consist of two parallel shafts alternately stacked with individual intermeshing cutters and spacers positioned on the shaft to form a helical pattern. The two shafts shall counter-rotate with the driven shaft operating at approximately two-thirds (2/3) the speed of the drive shaft.

B COMPONENTS

1. Frame

- a. Grinder frame shall be made of ASTM A 36 merchant quality steel. Frame shall be designed for channel installation and shall house the drum and grinder assembly.
- 2. Grinder End Housings, Covers, and Shafts
 - a. Grinder end housings shall be cast of ASTM A 536-84 ductile iron with a

cast-in-place flow deflector, designed to protect the bushings while guiding particles directly into the cutting chamber. The open area of the cutting chamber shall be a nominal height of 36¾-inches (933-mm).

- b. Top covers shall be ASTM A 536-84 ductile iron and bottom covers shall be ASTM A 36 hot rolled plates.
- c. Grinder drive and driven shafts shall be made of AISI 4140 Heat Treated Hexagon Steel with a tensile strength rating of not less than 149,000-psi (1,027-MPa). Each shaft diameter shall be a minimum of 2-inches (51-mm).

3. Hi-Flow Cutter Side Rail

- a. The inside profile of the side rail shall be concave to follow the radial arc of the cutters. The side rail shall be affixed to the grinder and maintain a clearance not to exceed 5/16-inch (8-mm) between the major diameter of the cutter and the concave arc of the side rail. Keeping this clearance directs larger particles toward the cutters to assure fineness of grind.
- b. Hi-Flow cutter side rail shall have evenly spaced slots that increase flow and decrease head loss.
- c. Side rail shall be cast of ASTM A 536-84 ductile iron.

4. Drum Side Rails

- a. The inside profile of the side rails shall be concave with its center offset from the radial arc of the drum to allow only two-point particle contact.
- b. Drum side rails shall be equipped with an adjustable extension strip that creates a tight interface between the rotating drums and the drum side rails to inhibit the passage of particles.
- c. Side rails shall be cast of ASTM A536-84 ductile iron.

5. Cutter Stack Tightening

- a. Cutter stack compression for maximum cutting efficiency shall be maintained by torquing a quick maintenance stack screw accessed through an opening in the grinder top cover.
- b. Removal of the grinder from the channel for cutter stack tightening shall not be required.

6. Motor

a. The grinder motor shall be a low speed, high torque, rotary power hydraulic motor that utilizes the hydraulic pressure developed by the hydraulic power unit to provide rotational torque for grinder operation.

7. Required Running Torque per Horsepower (kW):

a. Continuously: 1595 in-lbs. (242-Nm) minimumb. At momentary load peaks: 2400 in-lbs. (364-Nm)

8. Individual Cutters and Spacers

- a. The inside configuration of both the individual cutters and the individual spacers shall be hexagonal so as to fit the shafts with a total clearance not to exceed 0.015-inch (0.38-mm) across the flats to assure positive drive, minimize wear on the cutters, and increase the compressive strength of the spacers.
- b. Individual cutters and spacers shall be AISI 4130 Heat Treated Alloy Steel, surface ground for uniformity and through-hardened to a minimum 45-50 Rockwell C.
- c. Cutter configuration shall consist of both shafts with individual 11-tooth cam cutters. To maintain particle size, the height of the tooth shall not exceed 1/2-inch (13-mm) above the root diameter. Cutter to cutter root diameter overlap shall not be less than 1/16-inch (1.6-mm) or greater than 1/4-inch (6-mm) to maintain the best possible cutting efficiency while incurring the least amount of frictional losses.
- d. The cutter shall exert a minimum force of 680-lbs./HP (4060-N/kW)continuously and 1000-lbs./HP (5970-N/kW) at momentary load peaks at the tooth tip.

9. Cutter Shaft Bearings and Seals

- a. The cutter shaft's radial and axial loads shall be borne by a sealed oversize deep-groove (Conrad type) ball bearing at each end.
- b. The bearings shall be protected by a combination of a replaceable and independent tortuous path device and end face mechanical seals. Face materials shall be a minimum of tungsten carbide to tungsten carbide, not requiring an external flush or any periodic lubrication.
- c. Products requiring continuous or occasional lubrication or flushing shall not be accepted.
- d. The mechanical seal shall be rated at 90-psi (620-kPa) continuous duty by the seal supplier.
- e. The bearings shall be housed in a replaceable cartridge that supports and aligns the bearings and seals, as well as protects the shafts and end housings. The cartridge shall be independent of the stack height, therefore cutter stack tightness shall not affect seal performance. The seal faces shall maintain their

factory set preload independent of the cutter stack tightness.

- f. Seals shall meet required pressure rating regardless of cutter stack fit. Independent seal design shall provide protection against axial loading on shafts and bearings during shaft deflection.
- g. O-rings shall be made of Buna-N elastomers.
- h. Each seal face shall be locked to provide positive drive on the rotating face and a positive lock on the static face. This positive lock on the seal faces is critical to long seal life in applications where grit or other abrasive materials are present

2-03 HYDRAULIC POWER UNIT

A GENERAL

- 1. The hydraulic power unit provides hydraulic power to operate and control the grinder and dual rotating drums. In addition, the hydraulic power unit provides overload protection and quick response to frequent stop-start and severe reversing of the unit.
- 2. The entire hydraulic system, shall be designed for 3000-psi (20690-kPa) maximum pressure. At idle load conditions the system operating pressure should be in the 200- to 400-psi (1370- to 2759-kPa) range. Continuous operating pressure greater than 2000-psi (13793-kPa) shall not be acceptable.
- 3. As solids are encountered, pressure shall be automatically increased on a demand basis to provide the required torque necessary to continue rotation of the cutters.
- 4. Should the grinder demand pressure exceed 2850-psi (19655-kPa), a pressure switch shall be activated and a 2-way valve shifted. The rotation of the cutters shall instantly reverse for about one-half (1/2) to one (1) revolution or about 1/2-second. At the end of this time, the valve shall again be shifted and the cutters shall return to the forward direction.
- 5. If the obstruction has been cleared the unit shall continue to operate in the forward direction. If the obstruction has not cleared the reversing sequence shall repeat until the torque requirement is reduced or until it has had to repeat the reversing cycle 9-times within a 45-second time span. If 9 reversals have occurred within 45-seconds the controller shall shut down the hydraulic unit, activate an overload relay, and illuminate the indicating light.

B COMPONENTS

- 1. Hydraulic power unit shall include the following components:
 - a. 16 inch (406-mm) x 16-inch (406-mm) x 15-inch (381-mm), epoxy coated, 10-gallons U.S. (38-Liters) capacity reservoir.

- b. Positive displacement pump driven by a TEFC, C face, vertically mounted 5-HP (3.7-kW) motor.
- c. Combination oil level and oil temperature gauge.
- d. 10-micron, return line filter.
- e. Oil temperature limit switch set at 160°F (71°C).
- f. Oil level switch.
- g. Filler breather.
- h. Pressure switch preset at 2850-psi (19655-kPa).
- i. 110-volt solenoid valve.
- j. Relief valve preset at 3000-psi (20690-kPa).
- k. 2-1/2 inch (64 mm), 0- to 5000-psi (34450-kPa) oil filled gauge.
- 1. Suction strainer.
- m. Flexible hose rated for a minimum 3500 PSI (24138-kPa) working pressure.
- The rain resistant hydraulic power unit may be mounted in a remote location as required by design parameters in accordance with the supplier's recommendations.
- 3. Hydraulic connections between the grinder motor and the hydraulic power unit shall consist of two 1/2-inch (13-mm) flexible hoses. Each hose is rated for 3500-psi (24138-kPa). Hose pressure loss between the hydraulic pressure unit and the grinder motor shall not exceed 150-psi (1034-kPa) at 50°F (10°C) above ambient temperature.
- 4. On completion of installation, the hydraulic power unit shall be filled with a high quality fluid with a viscosity of approximately 100- to 250-SSU at 100°F (38°C) with good chemical stability and anti-foaming properties. The grades of hydraulic fluid shall be in accordance with the supplier's recommendations.
- 5. Hydraulic fluid shall be supplied by the contractor.

2-04 MOTOR CONTROLLER(S)

A GENERAL

- 1. The controller shall be the supplier's standard UL/cUL listed Model PC2240.
- The controller shall be equipped with a HAND-OFF/RESET-AUTO three-position selector switch. In OFF/RESET the grinder shall not run. In HAND the grinder shall run. In AUTO the grinder start and stop shall be controlled by a remotely located dry contact.
- 3. When a grinder jam condition occurs in either the HAND or AUTO mode the controller shall stop the grinder and reverse its rotation to clear the obstruction. If the jam is cleared, the controller shall return the grinder to normal operation. If the jam condition still exists, the controller shall go through eight additional reversing cycles within 45-seconds (9-times total) before signaling a grinder overload condition. When a grinder overload condition occurs, the controller shall shut the grinder off and activate a relay and fail indication.

- 4. If the grinder is stopped due to a fail condition and a power failure occurs, the fail indicator shall reactivate when power is restored.
- 5. Controller reset shall be from local panel controls only.
- 6. The controller shall provide overcurrent protection for the hydraulic power unit oil pump motor through an overload relay mounted directly on the oil pump motor starter.
- 7. The controller shall have indicator lights for POWER ON, RUN, GRINDER OVERLOAD, MOTOR OVERLOAD, OIL OVERTEMP, and LOW OIL LEVEL conditions.
- 8. The controller shall be rated 5-HP, 480volts, 3-phase, 60-Hz.
- 9. Short circuit protection requires that a properly sized circuit breaker or fuses be installed by others.

B COMPONENTS

1. Enclosure

- a. Enclosures shall be NEMA 4X rated, fabricated of fiberglass reinforced polyester resins, and shall be suitable for wall mounting. Doors shall have hinges and corrosion resistant latches.
- b. Enclosure shall house the control devices, relays, terminal blocks, and non-reversing motor starter.

2. Control Devices

- a. Pilot devices shall be mounted on the enclosure front panel.
- b. Indicators shall be integral transformer type with low voltage long life 6-volt lamps. Lamps and selector switches shall be heavy duty NEMA 4X type.
- c. Two normally open status contacts shall be provided. One for a RUN signal and one for a FAIL signal. The contacts shall be rated 10-amp, 240-VAC, resistive load.

3. Motor Starter

- a. A non-reversing motor starter shall be provided for the hydraulic pump oil motor.
- b. The overload (OL) relay shall be adjustable so that the range selected includes the FLA (full load amperes) rating and service factor.

2-05 SPARE PARTS

- A Supplier shall provide the following spare parts for each unit:
 - 1. Three (3) fuses
 - 2. Three (3) 6-volt, long life lamps
 - 3. One (1) complete gasket set
 - 4. Three (3) cutters
 - 5. Three (3) spacers
- B Controller spare parts shall be stored inside the controller.
- C Grinder spare parts shall be packaged in containers suitable for long term storage and shall bear labels clearly designating the contents and the equipment for which they are intended.

PART 3 EXECUTION

3-01 FACTORY TEST

A Each grinder and controller shall be factory tested to ensure satisfactory operation.

3-02 INSTALLATION

A Channel Monster grinder and controller shall be installed in accordance with the suppliers installation instructions and in compliance with all OSHA, local, state, and federal codes and regulations.

3-03 FIELD QUALITY CONTROL

A Supplier shall provide the services of a factory trained representative to check installation and to start-up each Channel Monster. Factory representative shall have complete knowledge of proper installation, operation, and maintenance of equipment supplied. Representative shall inspect the final installation and supervise a start-up test of the equipment.

3-04 OPERATION AND MAINTENANCE MANUALS

A Supplier shall provide three (3) Operation and Maintenance Manuals. The manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended maintenance schedule, and the recommended lubricants.

DIVISION 15 - MECHANICAL

SECTION 15393

SLUDGE BELT FILTER PRESS

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SECTION 15393

SLUDGE BELT FILTER PRESS

PART 1 - GENERAL

1-01 SCOPE OF WORK

A. This section shall include furnishing, unloading at the jobsite, handling, storage and installing a complete sludge dewatering system including one (1) belt filter press, complete with ancillary equipment, as specified and indicated on the drawings and as required to meet the specified performance requirements.

1-02 GENERAL

A. Equipment furnished and installed under this section shall be fabricated, assembled, erected and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless the Contracting Officer notes exceptions.

1-03 WORKMANSHIP AND DESIGN

A. All components of the sludge dewatering equipment shall be engineered for long, continuous, and uninterrupted service. Provisions shall be made for easy lubrication, adjustment, or replacement of all parts. Corresponding parts of multiple units shall be interchangeable.

1-04 SYSTEM DESCRIPTION

A. The sludge dewatering system shall consist of one (1) belt filter press and all appurtenances. Each belt filter press shall be a complete prefabricated unit consisting of at least a sludge conditioning system, a gravity drainage section, a pressure section, a belt alignment and tensioning system and a belt washing system. Only units having a measured belt width of 2.2 meters, and an effective belt width of 2.0 meters shall be considered acceptable under this specification. The unit shall be the Klampress 2.0 Meter with Extended Gravity and Wedge Section Belt Filter Press Z, or equal as approved by the Contracting Officer.

Should equipment other than that specified be proposed, the Contractor shall be responsible for any redesign based on the requirements contained herein.

1-05 QUALITY ASSURANCE

A. Consideration will be given only to products of manufacturers who can demonstrate that their equipment fully complies with all requirements of the Specifications and Contract Documents. The equipment shall be supplied by a firm which has been regularly engaged in the design, fabrication, assembly, testing, start-up and service of full scale belt filter presses, of the same model and size as proposed, operating in the

- U.S., with similar sludges, for a period of not less than ten (10) years prior to the bid date of this contract. The filter press manufacturer shall be certified to ISO 9001 quality standards as a belt press manufacturer in the United States. The Contractor shall submit data to substantiate the manufacturer's experience in accordance with the Contract Documents.
- B. To accommodate future process changes, the belt filter press shall be designed to accept extended gravity and wedge sections as well as additional plows in the gravity section and rollers in the pressure section to increase the system's performance.

1-06 PATENTS

- A. The manufacturer warrants that the use of this system and its equipment, in the process for which the system has been expressly designed, will not infringe any U.S. or foreign patents or patents pending. In the event of any claim of infringement the manufacturer shall defend and indemnify the owner free from any liabilities associated with the use of the patented equipment or process.
- B. The manufacturer hereby grants to the owner, in perpetuity, a paid-up license to use any inventions covered by patent or patents pending, owned, or controlled by the manufacturer in the operation of the facility being constructed in conjunction with the equipment supplied under this contract, but without the right to grant sublicenses.

1-07 WARRANTY

A. The manufacturer shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship, for a period of twelve (12) months from the date of start up, not to exceed eighteen (18) months from the date of delivery, unless noted otherwise within the specifications.

1-08 CONDITIONS OF SERVICE

- A. The sludge dewatering equipment shall be designed to adequately condition and dewater the sludge so that a dewatered sludge cake is produced that easily discharges from the dewatering unit without blinding and that may be handled by the pump or conveying equipment.
- B. Each unit shall be designed to operate in the environment for which it is intended, continuously or intermittently on demand, and shall perform the required dewatering operations without spillage of water or sludge beyond the nominal machine envelope.
- C. The description of the sludge to be fed to the belt filter press is as follows:
 - Type of sludge: Waste Activated Sludge from an activated sludge plant, which is aerobically digested.

1-09 SUBMITTALS

A Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures.

PART 2 - MECHANICAL REQUIREMENTS

2-01 MATERIALS AND COATINGS

A. All materials used in the construction of the sludge dewatering equipment shall be of the best quality and entirely suitable in every respect for the service required. All structural steel shall conform to the ASTM Standard Specification for Structural Steel, Designation A36/A36M. All iron castings shall conform to the ASTM Standard Specifications for Gray Iron Castings, Designation A48, and shall be of a class suitable for the purpose intended. Other materials shall conform to the ASTM Specifications where such specifications exist and the use of such materials shall be based on continuous and successful use under similar conditions of service.

All electrical components shall be U.L. listed where such listing exists and all electrical control panels shall be assembled in U.L. approved facilities. All structural carbon steel plates and shapes shall have a minimum thickness of 1/4 inch and shall be hot dip galvanized in accordance with ASTM A-123.

Unless specified otherwise herein, all metals in contact with polyelectrolyte or sludge, and all other components specified to be stainless steel, shall be type 316L stainless steel.

B. The following materials and coatings shall be provided for the belt filter press and related components unless specified otherwise herein:

Bearing housings Belt support grids

Belt wash housing

Belt wash spray tube and nozzles

Belt wash piping

Chicanes

Chutes (feed and discharge)

Doctor blades
Drain trays
Drain tray piping
Electrical junction box
Electrical conduit

Electrical switch enclosures

Frame

Nylon coated, cast iron

Stainless steel, 10 gauge fitted with UHMW polyethylene wiper bars

Stainless steel, 14 gauge.

Stainless steel.

Schedule 80 PVC, 1 1/2 inch.

Galvanized steel support rods, galvanized cast iron holders and U.H.M.W. polyethylene blades.

Stainless steel, 10 gauge. U.H.M.W. polyethylene.

Stainless steel, 14 gauge.

Schedule 40 PVC. Stainless steel

SO Cord

NEMA 4, press mounted

A36 steel, hot dip galvanized, ASTM A123, minimum 3.9 mils.

Hardware, fasteners, 316 stainless steel.

springs, clips, etc. Hydraulic cylinders:

body: FRP tube with high strength glass

filled nylon head

rod: Solid 316 stainless steel with hard

surface treatment

Miscellaneous Carbon steel surfaces to be hot

dipped galvanized per ASTM A123

Polymer mixer housing Cast 316ss

Counterweight Cast iron, galvanized Injection ring UHMW polyethylene Splitter Manifold UHMW polyethylene

Rollers (solid) Carbon steel, ½" wall. Drive

rollers coated with Buna N rubber, ¼", other solid rollers coated with

thermoplastic nylon, 25 mils.

Rollers (perforated) ¼" wall carbon steel hot dip

galvanized, or nylon coated

Roller shafts Forged steel ASTM 572 Grade 50,

perforated roller shall have 8620 Stainless steel, 14 gauge.

Sludge containment barriers

- B. Other types of protective coatings shall not be acceptable. All hot dip galvanizing shall be applied in accordance with ASTM-A123. Zinc flame spray shall not be considered an acceptable substitute to this specification.
- C. The heat setting thermoplastic nylon coating, specified herein, shall have the following properties:

Coating Properties	Test Method	<u>Value</u>
Hardness, Shore D	ASTM D-2240	77
Specific Gravity	ASTM D-792	1.06-1.20
Impact, RT & 45 F	ASTM D-2794	160 in lbs
		Direct Pass
Melting Point	ASTM D-789	370° F

Coating Properties	Test Method	Value
Coaume I robci ito	<u> </u>	<u>vanuc</u>

Abrasion Resistance ASTM D-4060 8-18 mg. Wt. loss (varies with color) CS17/1000/1000 Taper Abrader)

Buna N rubber coating shall have the following properties:

Tensile strength, ASTM D-412	2500 psi
Tear strength, die C, ASTM D-624	250 psi
Elongation at break, ASTM D-412	160%
Hardness, Shore A, ASTM D -676	90

2-02 SLUDGE CONDITIONING SYSTEM

- A. Each belt filter press shall be provided with a sludge conditioning system, designed to efficiently mix polymer with the sludge and to adequately condition the sludge, for optimum dewatering.
- B. The sludge conditioning system shall be mounted upstream of the press and shall consist of an in-line, non-clog, static mixer with a variable orifice and a vortex polymer injection ring. The belt filter press manufacturer shall be required to provide, to the Contracting Officer, a proper layout for the system. The sludge conditioning system shall be capable of providing the following performance:
 - 1) The polymer and sludge must be instantly mixed (less than 1.0 seconds at 60 GPM).
 - 2) Mixing energy must be independently adjustable during operation.
 - Flocculation time must be independently adjustable, by the displacement of flanged pipe sections, with the mixer, at a minimum of three locations in the sludge feed piping.
- C. The manufacturer shall be required to demonstrate, during the start-up and calibration phase, that flocculation time can be adjusted by one man, within sixty minutes. The sludge conditioning system shall meet the following mechanical specifications:
 - 1) The in-line mixer shall have a flanged, cast housing, an adjustable orifice plate with shaft and O-ring seal connected to an externally mounted lever and counterweight and a removable side plate for inspection and cleaning.
 - 2) The open throat area shall be fully adjustable downward and shall open automatically to prevent clogging.
 - The position of the counterweight on the externally mounted orifice plate lever shall be fully adjustable, within a 360 degree circle, to allow for adjustment of the mixing energy, regardless of the mounting angle, while the unit is in operation.
 - C. The polymer mixer shall be designed specifically for it's intended use. The use of modified check valves or mixers requiring electrical motors and controls shall not be acceptable to this specification.

2-03 STRUCTURAL MAIN FRAME

- A. The structural main frame shall be fabricated of steel members conforming to AISC Standard Specifications for Structural Steel, into a rigid structure, adequately braced to withstand intended loads without excessive vibration or deflection.
- B. The frame shall have a minimum safety factor of 5 and maximum deflection of 0.025 inches under maximum loading. The moment of inertia of the structural members shall be adequately chosen to provide the safety factor and deflection rate specified herein.
- C. Maximum load on the frame shall be based on the summation of forces applied to the frame from roller mass forces, weight of the rollers including the sludge and belts and belt tension forces. Belt tension forces shall include, but not be limited to, a belt

- tension of 50 psi per belt plus the tension produced by the driving torque of the motor at nameplate ph. Certified calculations, showing the frame to be in compliance with the specification, shall be submitted as set forth in the contract documents.
- D. The framework shall be of welded and/or bolted construction. All welding shall conform to the American Welding Society Structural Welding Code.
- E. The structure shall be designed for installation on a prepared concrete foundation and secured with anchor bolts. Permanent lifting lugs shall be provided as necessary to allow installation and removal of the belt filter press.
 - The construction shall allow easy access and visual inspection of all internal components.
- F. The manufacturer shall warrant the frame and the coating for a period of three years from the date of start-up, not to exceed three and a half years from the date of delivery. The frame shall not require preventive maintenance during the warranty period. Any defects or corrosion occurring within the warranty period shall be repaired or replaced at no additional cost to the owner.

2-04 GRAVITY DRAINAGE SECTION

- A. Each belt filter press shall be furnished with a gravity drainage section to accept sludge from the sludge conditioning system. The gravity drainage section shall be furnished with a sludge feed chute and an inlet distributor to evenly distribute the conditioned sludge over the effective width of the moving filter belt.
- B. The conditioned sludge shall be contained on the belt with adjustable containment barriers equipped with replaceable rubber seals to prevent leakage. Rubber seals shall be designed to be attached to the containment barriers, with a friction fit, to allow for easy replacement without the use of tools.
- C. The gravity drainage section shall have a minimum dewatering area of 93 square feet.
- D. The filter belt, while in the gravity drainage section, shall be supported by a steel grid fitted with high-density polyethylene wiper bars. The wiper bars shall be spaced at a maximum of two and one half inches and shall have a nominal wear thickness of one half inch, to minimize the frequency of replacement. The wiper bars shall be arranged in a chevron pattern, with the apex toward the sludge inlet, to reduce the possibility of belt creasing. The belt support grid shall be a minimum of 2 inches wider than the belt on each side and so designed to reduce belt wear. Wiper bars constructed of fiberglass, other high friction materials, or table rollers, which require extra maintenance due to coatings, and additional bearings shall not be considered an acceptable substitute to this specification.
- E. The gravity drainage section shall be furnished with chicanes (plows) to adequately furrow the conditioned sludge to facilitate drainage. Each row of chicanes shall be provided with a single lifting handle, designed to remove the entire row of chicanes at least 6 inches from the belt, out of the sludge flow, to facilitate cleaning. Chicanes shall

be designed to be individually adjustable laterally and shall pivot to allow them to pass over obstructions on the belt. The minimum of number of chicanes shall be 84, and the minimum number of rows shall be 10.

The manufacturer shall be required to demonstrate that each individual chicane shall be capable of allowing a one-inch vertical obstruction on the belt to pass under them without damage to the equipment.

F. Vacuum assisted, inclined gravity drainage sections, which are subject to flooding, or independent gravity drainage sections, which require a separate belt drive motor and tensioning device will not be considered an acceptable substitute to this specification.

2-05 PRESSURE SECTION

- A. Each belt filter press shall be furnished with a pressure section following the gravity drainage section. The pressure section shall consist of two stages.
- B. The first stage of the pressure section shall be the increasing pressure (wedge) zone, where the upper and lower belts gradually converge, creating a belt/sludge sandwich. In the wedge zone the sludge cake is prepared for the shear pressure zone by generating continuously increasing pressure on the sludge as it travels through the zone.

For process flexibility, the amount of pressure exerted on the sludge and the rate at which the increasing pressure is applied shall be independently adjustable while the machine is in operation utilizing an adjustable steel wedge plate located between the belts, pressing down on the sludge. These adjustments shall be capable of being performed without causing undue wear on the belts or other components and without causing the belts to be moved from their normal path between rollers. The sludge inlet height at the entrance to the wedge plate shall be adjustable between one and three inches.

The minimum effective dewatering area in the increasing pressure zone shall be 59 square feet. The belt in the increasing pressure zone shall be supported in the same manner as supported in the gravity drainage section. The effective dewatering area shall be measured on both belts when the wedge zone is mounted vertically and on the lower belt only when the wedge zone is mounted horizontally.

C. The second stage of the pressure section shall be the shear pressure zone consisting of a 12" radius curved grid and a minimum of 8 pressure rollers arranged to provide a serpentine pattern of belt travel.

The curved grid shall further enhance dewatering by causing the pressure on the sludge between the belts to increase and press out free water. The horizontal wiper bars shall give a wiping action to the bottom of the belt in the wedge zone that will quickly remove water from the belt allowing faster drainage. The belt-supporting grid in the wedge zone shall be horizontal for the first several feet and blend into a gradual downward curve, which shall be tangent to the perforated pressure roller that follows.

The first roller in the increasing pressure zone shall be a 16" perforated roller. Rollers shall be constructed as specified under "Rollers". The rollers shall be supported by bearings mounted on the end shafts as specified under "Bearings".

The minimum effective dewatering area in the shear pressure zone shall be 121 square feet. The effective dewatering area in the shear pressure zone shall be defined as the area of curved grid and rollers in contact with the belts, meaning full width of the belt.

2-06 ROLLERS

A. All Solid Rollers shall be constructed using one-piece forge shafts and end plates. The forged stub shaft unit shall eliminate all welding of the roller shafts in the region of highest stress where the shafts join with the end plates. Welded up constructions of round bar and flat plates that create built in stresses and stress concentrations will not be considered equal to this specification. The forged stub shaft unit shall be welded to the roller shell with a machine-applied weld using the submerged arc process. The weld depth shall be equal to the wall thickness of the roller shell. The roller shall be machined so that the total indicated runout of the shell relative to the journals is 0.010 inch maximum. Total surface machining is required to provide a smooth surface for the coating of thermoplastic nylon or to prepare the roller for cladding.

The perforated roller, which is the first roller in the pressure section, is designed to allow water to escape out both ends. It shall be constructed with a solid through shaft and at least five (5) radial vanes to support the perforated shell.

B. The forged stub shaft unit shall be made of ASTM A572 Grade 50 Type 2 or equal. The roller shells may be ASTM A53 or equal. The perforated roller shall have a solid shaft of cold drawn carbon steel, AISC 8620 and the shell and radial vanes shall be ASTM A36 or equal, or stainless steels may be substituted on special order.

Drive rollers shall be coated up to the point of insertion into the bearings by a 1/4-inch minimum thickness of Buna-N rubber. Solid and perforated rollers shall be coated with a 30-mil minimum thickness of thermoplastic nylon. See detail spec for these coatings in Section 2.01.

Solid rollers may also be clad with 304 or 316 stainless steel. The cladding will be welded to the fully machined roller entirely covering the roller up to the point of insertion into the bearings. Welded stainless steel shafts in lieu of the forging are not acceptable for this application due to the lower strength and higher stress.

C. All solid roller shells shall have a mill spec minimum wall thickness of 1/2 inch. Heavier walls shall be used where required to meet the maximum stress and deflection limits. The roller bearing journals shall be turned to 75 mm to accept direct mounted 75 mm bore bearings. The minimum thickness of the forged flange that forms the end plates shall be one (1) inch.

The perforated roller shall have punched holes of 1 1/4 inch diameter minimum to prevent bridging of solid material. The punched shell shall be rolled with the smooth side out. The shell shall be a minimum 1/4-inch thick.

D. The rollers shall be analyzed using finite element stress analyses. Certified calculations, showing the maximum stress to be less than 1/5 the yield strength of the material and the maximum deflection at mid span to be less than 0.050 inch shall be submitted as set forth in the contract documents. The standard load case for the pressure rollers shall be a distributed load in the belt contact area equivalent to 50-pli belt tension, weight loading and drive torque. The standard load case for the other rollers shall be a distributed load in the belt contact area equivalent to 50-pli belt tension and weight loading.

2.07 BEARINGS

A. All rollers shall be supported by greaseable type, high capacity design roller bearings, in sealed, splash proof, horizontal split case pillow block housings. The bearings shall be direct mounted on the shaft with a shrink fit backed by a retaining snap ring.

Bearings supporting the steering rollers shall be non-self aligning cylindrical roller bearings in pivot mounted pillow block housings.

All other rollers shall be supported by self-aligning Type "E" spherical roller bearings with metallic cages, (plastic cages in spherical roller bearings are not acceptable) mounted in fixed pillow block housings.

Bearings supporting all the rollers except the steering rollers shall be 75mm bore double row spherical bearings (type E construction) AFBMA size number 22215 with a dynamic radial capacity of 41,500 lb.. Bearings supporting the steering rollers shall be 75mm bore single row cylindrical roller bearings AFBMA size number 2215 with a dynamic radial capacity of 36,500 lb.

- B. Bearing housings shall be cast iron with two mounting bolts and four cap bolts. The outer side of the housing shall be solid, without end caps or filler plugs. The housings shall be designed with an integrally cast water trough which, when shrouded by a shaft mounted water flinger, shall divert water from the bearing seal area. The housings shall be cleaned, iron phosphate, and coated with nylon to a thickness of 8-12 mil.
- C. The bearing seal in the pillow block housing shall be of nonmetallic construction with a carrier/flinger, which rotates with the roller shaft. A static sealing arrangement between the carrier/flinger and the shaft shall be a triple rubber seal, constructed in a manner that prevents relative rotation between the seal and the shaft. A dynamic sealing arrangement between the carrier/flinger and the bearing housing shall consist of a primary dynamic contact seal of ozone resistant rubber which shall seal by rotational contact with a machined housing surface. A secondary dynamic seal shall be a labyrinth seal between the carrier/flinger and the bearing housing which utilizes a nonmetallic retaining ring to hold the seal assembly in position within the housing.
- D. Bearing lubrication shall be performed through stainless steel grease fittings mounted on each bearing housing. All bearings shall be outboard (externally mounted) and shall be greaseable while the unit is in operation. Lubrication shall not be required more often than once every six months.

E. The manufacturer of the belt filter press shall warrant the complete bearing assembly, as specified herein, for a period of five years from the date of start-up, or acceptance of the equipment, whichever occurs first. The warranty shall include all parts and labor for repairing or replacing any bearing that fails during the warranty period.

2-08 BELT WASH SYSTEM

- A. Each belt filter press shall be equipped with individual belt wash stations for both the upper and lower belts. Each station shall consist of a spray pipe, fitted with spray nozzles, contained within a fabricated housing which encapsulates a section of each belt. The housing and nozzle assembly shall be readily removable.
 - Nozzle spacing and spray pattern shall be such that the sprays from adjacent nozzles overlap one another at the belt surface. Individual spray nozzles shall be replaceable.
- B. The housing shall be sealed against the belt with rubber seals. The spacing between the upper and lower housing shall be adjustable to insure continuous contact between the seals and belt. The seals shall be replaceable without disassembly of the wash station.
- C. Each belt wash station shall be furnished with a drain valve having an external handwheel to which is mounted a stainless steel cleaning brush located inside the spray pipe. One full turn of the handwheel shall cause the brush bristles to enter each spray nozzle, and dislodge any solid particles which have accumulated, open the valve and allow the solids particles to be flushed into the drainage system.
- D. Belt wash stations shall be the type manufactured by Appleton Manufacturing, Menasha Corporation, Menasha, Wisconsin or approved equal.
- E. Each belt wash station shall be positioned such that the washing is performed after the cake has been discharged from the belt. The belt wash station shall extend over the full width of the filter belt by a minimum of two (2) inches. The belt shall be cleaned by the belt wash with no blinding.
- F. The belt press manufacturer shall furnish a separately mounted in-line booster pump rated at sufficient capacity and discharge head to meet the process requirements. All controls and equipment necessary to provide a complete and operating system shall be provided for the pumps by the belt press manufacturer, including the controls from the machine control panel as specified hereinafter.

2-09 BELT ALIGNMENT SYSTEM

- A. Each belt shall be provided with an automatic belt alignment system to assure proper alignment of both belts at all times. Belt alignment shall be accomplished using a self-contained system that does not require an external power source, except for electrical power.
- B. The belt alignment system shall be provided with sensing devices designed with a counter-weighted arm fitted with a ceramic plate, which rides on the edge of the belts to

detect their position. The arm shall operate a pilot valve, which in turn affects the position of a hydraulic actuator connected to a pivoted belt alignment roller. The pivoting action of the belt alignment roller shall cause this roller to skew from its transverse position to guide the belts centrally along their path.

- C. The alignment systems shall function as a continuous automatic belt guidance system and shall be an integral part of the press. The alignment system shall operate with smooth and slow motions resulting in a minimum of belt travel from side to side. The use of electrical servos or systems which utilize devices that maintain alignment by a large snap action type alternating movement of the alignment roller shall not be considered acceptable to this specification.
- D. Backup limit switches for the belt alignment system shall be provided on the machine with sufficient contacts to de-energize all drives and sound an alarm in case of belt over-travel.

2-10 BELT TENSIONING SYSTEM

- A. Each belt shall be provided with a belt tensioning system. The belt tensioning system shall be hydraulically actuated. The design of the tensioning system shall be such that adjustments in tension shall result in immediate changes in dewatering pressure.
- B. The belt tensioning system shall be furnished with a control station located on the press so that shutoff of belt tension is possible. Actual belt tension, shall be maintained automatically despite process changes or belt stretching and not require additional adjustment by the operator to maintain the setpoint.
- C. The belt tensioning system shall be designed to accommodate maximum belt stretching during the useful life of the belt.
- D. The tensioning system shall have two hydraulic cylinders for each belt, directly connected to a rigid tensioning yoke, to provide absolute parallel tension across the entire width of the belt. The tension force shall be constant over the full range of the cylinder.

Manual tensioning systems or pneumatic bellows systems, which do not automatically maintain a pre-set pressure on the sludge despite process changes, are not acceptable. Furthermore, air bladders change diameter and, as a result, force as they extend.

E. Sensing devices shall be furnished for each belt with sufficient electrical contacts to deenergize all drives and sound an alarm in the event of failure of the belt or the tensioning system.

2-11 HYDRAULIC POWER UNIT

A. Each belt filter press system shall be provided with a dedicated hydraulic power system to provide pressurized oil for the steering and tensioning. The unit shall consist of a one-gallon reservoir; variable-displacement pressure compensated hydraulic oil pump

- and drive motor, hydraulic oil filter (reusable), pressure gauges, piping, valves and cylinders to make a complete operational system.
- B. The pump, motor, reservoir, oil filter and valves shall be mounted directly to the belt press frame to minimize excess piping runs, fittings and hoses. All hydraulic lines shall be properly sized for the pressure and flow of the unit. Pressurized hydraulic lines shall be 316ss tubing and shall be rigidly supported on the structural frame of the press. Flexible lines to cylinders, low-pressure connections to the reservoir, etc. shall be hose of the material and construction appropriate to the application. The hydraulic reservoir shall be made of high-density polyethylene (HDPE) and shall be translucent to allow visual inspection of the oil level.
- C. The pump motor shall be a 1hp and shall not exceed a noise level of 70 DbA. The motor shall be a cast iron TEFC 1,200 rpm, NEMA B design with a "C" face mounting for the hydraulic pump adapter.
- D. Hydraulic system controls shall be grouped for easy access and ease of operation. There shall be means provided to retract the belt tension cylinders for service. The valves, fittings, manifold and associated parts shall be of non-corroding materials such as FRP, glass filled Nylon and stainless steel.
- E. The oil pressure gauge(s), one for each pair of belt tension cylinders (upper & lower belt) shall indicate oil pressure in PSI and the belt tension in PLI. Normal operating limits shall be indicated on the face of each gauge. Low-pressure switch (es) shall be provided to sense the absence of belt tension pressure.
- F. Hydraulic cylinders shall have a non-corrosive body and 316 stainless hardware and cylinder rod. The cylinder rod shall be solid stainless with a hardened polished seal contact surface. Chrome or nickel plated rods are not acceptable.

2-12 BELT DRIVE

A. Input power to the drive roller shaft shall be supplied through an A.C., variable frequency drive unit. Speed shall be controlled through cyclical variation in motor current, which is operator set at the control panel. The drive roller speed reduction is obtained through a helical gear reducer.

2-13 DEWATERING BELTS

- A. Each belt filter press shall incorporate the use of two dewatering belts. Belts shall be fabricated of monofilament polyester and shall have 316 Stainless Steel seams. The mesh design shall be selected for optimum dewatering of the sludge to be processed and provide for a 2,000-hour belt life when operated in accordance with the manufacturer's instructions.
- B. Belt selection shall be based on the manufacturer's experience obtained from testing the sludge during start-up of the belt filter press and at other installations dewatering similar sludges with similar polyelectrolyte conditioning chemicals.

- C. Each belt and connecting seam shall be designed for a minimum tensile strength equal to five times the normal maximum dynamic tension to which the belt shall be subjected. The seam shall be designed to fail before the belt.
- D. Belts shall be designed for ease of replacement with a minimum of belt filter down time. Belt replacement shall be such that disassembly of the equipment is not required.

2-14 DISCHARGE BLADES

A. Discharge blades shall be provided to scrape dewatered sludge from the belt at the final discharge rollers. The blades shall be of ultra high molecular weight polyethylene (UHMW) construction and shall be readily removable.

2-15 DRAINAGE PANS

A. Drainage pans shall be provided as necessary to contain filtrate from all dewatering areas within the belt filter press without splashing and to prevent rewetting of downstream cake. All drainage piping shall be furnished, adequately sized for the intended service, and rigidly attached to the press frame. Drainage piping shall terminate inside the structural frame at the bottom of the press. Drain connection shall be self-venting to prevent overflow. Drainage pans shall be located so that the moving belts do not come into contact with the pans under any condition.

2-16 CONTROL SYSTEM

- A. Each belt filter press shall be provided with a control panel that will contain the necessary control devices and equipment for controlling the dewatering process as described herein.
- B. The control panel shall accept a 460 VAC, 60 hertz, 3-phase power input. A main disconnect circuit breaker and operator mechanism shall be included. When the disconnect is in the open position, all power shall be removed from the control system. IEC rated motor starters shall be provided for the hydraulic unit and washwater pump. A VFD will be supplied for the belt drive. Short circuit protection for each motor shall be accomplished utilizing thermal magnetic circuit breakers. Individual thermal overload protection shall be provided (except for the belt drive). A control power transformer shall be included that will provide 120 VAC control power to the system. All logic functions for the system shall be performed by an industrial programmable logic controller (PLC) located in the control panel.
- B. Located on the front of the control panel shall be a CONTROL POWER OFF/ON switch. When in the ON position, the CONTROL POWER ON pilot light will be illuminated and control power shall be distributed to the control system. When in the OFF position, the control system shall be held de-energized. Also located on the control panel shall be an EMERGENCY STOP pushbutton. It shall be an illuminated mushroom head style pushbutton that when depressed shall immediately de-energize all moving equipment in the system. An alarm horn shall be included for audible alarm annunciation.

C. As a minimum, the following control pilot devices shall be located on the front of the control panel:

HAND/OFF/AUTO MODE selector switch

HAND MODE indicator

AUTO MODE indicator

AUTO START pushbutton

AUTO STOP pushbutton

SYSTEM RESET pushbutton

ALARM SILENCE pushbutton

LAMP TEST pushbutton

PRESS READY indicator

DEWATERING OFF/ON selector switch

WASHDOWN CYCLE ON indicator

WASHWATER PUMP START pushbutton

WASHWATER PUMP STOP pushbutton

WASHWATER PUMP RUNNING indicator

HYDRAULIC PUMP START pushbutton

HYDRAULIC PUMP STOP pushbutton

HYDRAULIC PUMP RUNNING indicator

BELT DRIVE START pushbutton

BELT DRIVE STOP pushbutton

BELT DRIVE RUNNING indicator

CONVEYOR START pushbutton

CONVEYOR STOP pushbutton

CONVEYOR RUNNING indicator

BELT DRIVE SPEED controller (0-100%)

SLUDGE PUMP START pushbutton

SLUDGE PUMP STOP pushbutton

SLUDGE PUMP RUNNING indicator

SLUDGE PUMP SPEED controller (0-100%)

POLYMER PUMP START pushbutton

POLYMER PUMP STOP pushbutton

POLYMER PUMP SPEED controller (0-100%)

LOW WASHWATER PRESSURE indicator

LOW HYDRAULIC PRESSURE indicator

BELT MISALIGNED indicator

BELT BROKEN indicator

NO CAKE indicator

EMERGENCY STOPPED indicator

The control panel shall require the following discrete signal inputs from others. The signals shall be normally open dry contacts and shall close when the equipment is running.

- a) Sludge pump running
- b) Polymer pump running
- c) Conveyor running

The control panel shall provide the following discrete signals for use by others. The signals shall be dry contacts.

- a) Press running (N.O. close when running)
- b) Press fault (N.O. close on alarm)
- c) Conveyor run (N.O close to run)
- d) Sludge pump run (N.O. close to run)
- e) Polymer pump run (N.O. close to run)

The control panel shall require the following analog signals from others.

- a) Sludge pump speed or flow (4-20 mA)
- b) Polymer pump speed or flow (4-20 mA)

The control panel shall provide the following analog signals.

- a) Sludge pump speed (4-20 mA)
- b) Polymer pump speed (4-20 mA)
- D. The press may be operated in the automatic mode by placing the HAND/OFF/AUTO selector switch in the AUTO position. The AUTO MODE indicator will illuminate and the operator will press the AUTO START pushbutton. At this time, the hydraulic pump, washwater pump and washwater valve will be energized and a belt tensioning time delay will start.
- E. After the belt tensioning timer times out, the belt drive will be energized and a belt pre-wet time delay will start. After the pre-wet timer times out, the conveyor PRESS READY pilot light will be illuminated and, if the DEWATERING ON/OFF selector switch is in the ON position, the sludge and polymer pumps will be energized.
- F. Pressing the AUTO STOP pushbutton will de-energize the sludge and polymer pumps, illuminate the WASHDOWN ON pilot light and start a wash down time delay. After the wash down timer times out, the belt drive, washwater valve, washwater pump, hydraulic pump and conveyor will be de-energized.
- G. To operate the press in the manual mode, the operator will place the HAND/OFF/AUTO selector switch in the HAND position. The HAND MODE indicator will be illuminated. The operator will start the washwater pump by pressing the WASHWATER PUMP START pushbutton; start the hydraulic pump by pressing the HYDRAULIC PUMP START pushbutton. Anytime the washwater pump is running, the washwater valve shall be energized.

The operator should not proceed until the belts have been fully tensioned. No interlock is provided to prevent the operator from starting the belt drive in the manual mode. Pressing the BELT DRIVE START pushbutton will energize the belt drive and after a pre-wet time delay will illuminate the PRESS READY pilot light. At this time, the operator will start the conveyor by pressing the CONVEYOR START pushbutton, start the sludge pump by pressing the SLUDGE PUMP START pushbutton and start the polymer pump by pressing the POLYMER PUMP START pushbutton.

Pressing the respective STOP pushbutton in the reverse order stated above will stop the system.

H. When any of the following fault conditions occur, in automatic or manual mode, the appropriate fault indicator will be illuminated, the alarm horn will sound and the belt filter press and associated equipment will be de-energized.

EMERGENCY STOP LOW WASHWATER PRESSURE HYDRAULIC PRESSURE FAULT BELT MISALIGNED BELT BROKEN

The following fault conditions will cause the wash down cycle to be initiated in the automatic mode (annunciation only in the manual mode):

NO CAKE

- I. Control panel enclosures shall be fabricated of type 304 stainless steel and shall be suitable for NEMA 4X service. Enclosures shall be manufactured by Hoffman Manufacturing, Hammond Manufacturing, or equal.
- J. All power and control wiring shall be 600 volt, type THHN/THWN insulation stranded copper and shall be sized for the required load, 14 AWG minimum.
- K. The circuit breaker for the main disconnect shall be thermal magnetic molded case units. The circuit breaker shall be Square D, Class 650, Type FAL, or equal.
- L. Motor starters shall be full voltage, nonreversing, IEC style across-the-line units. Coils shall be 120 VAC.
- M. All selector switches shall be heavy duty, oil tight/watertight, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere continuous service. Selector switches shall be Square D, Type SK or equal.
- N. All pushbuttons shall be heavy duty, oil tight/watertight, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere continuous service. Pushbuttons shall be Square D, Type SK or equal.
- O. Pilot lights shall be heavy duty, oil tight/watertight, corrosion resistant units rated for NEMA 4X service. Units shall be 120 VAC transformer type. Pilot lights shall be Square D, Type SK or equal.
- P. Terminal blocks shall be high density, solderless box lug style, with 600 volt rating. Terminal blocks shall be Square D, Class 9080, Type M, or equal.
- Q. The PLC shall be a modular type with discrete and analog capabilities. The CPU shall have 4K minimum RAM for user instructions. The unit shall have battery backed RAM and EEPROM backup. The PLC shall be a General Electric Series 90-30, or equal.

R. The VFD shall be UL listed and shall be IDM Controls Model PoWrMaster or approved equal.

2-17 SPARE PARTS

- A. The following spare parts shall be furnished with the belt filter presses:
 - 1. One set of filter belts for each press supplied.
 - 2. Two complete sets of doctor blades for each press supplied.
 - 3. One of each size and type of roller bearing complete.
 - 4. Two complete sets of rubber seals for the gravity and wedge zone for each press supplied.
 - 5. Two complete sets of belt wash box seals for each press supplied.

PART 3 MANUFACTURER'S SERVICES

3-01 START-UP AND OPERATOR TRAINING

- A. Services of the manufacturer's factory trained representative, who is specifically knowledgeable in the type of equipment specified herein, shall be provided during the equipment installation period. Upon complete installation of equipment by installing contractor, including placement of equipment, setting and leveling the equipment, piping and electrical connections to all the equipment specified herein, the manufacturer's service representative will approve the installation and begin start up and training.
- B. Upon approval of the installation, the services of the manufacturer's factory trained representative shall be provided at the project site for equipment start-up and calibration. During the start-up and calibration phase the manufacturer's representative shall inspect all system components for proper connection and alignment and assist the installation contractor in placing the equipment in a proper operating condition.
- C. Upon satisfactory completion of the start-up and calibration, a representative of the manufacturer shall be provided to instruct personnel in the proper operation and maintenance of the equipment. The manufacturer's representative who will be providing the instruction shall have prior operation, maintenance and instructing experience acceptable to the Contracting Officer. The contractor shall submit the individual's name and qualifications to the Contracting Officer for approval at least one week prior to the scheduled operating and maintenance instruction sessions.

DIVISION 15 – MECHANICAL

SECTION 15394

CENTRIFUGAL BLOWER

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SECTION 15394

CENTRIFUGAL BLOWER

PART 1 - GENERAL

1-01 SCOPE OF WORK

A. The Contractor shall furnish and install four(4) centrifugal blowers to support the Aerobic Digester equipment specified in Section 15392. All work described in this Section shall be closely coordinated with the Aerobic Digester manufacturer and be sized according to the requirements of the Aerobic Digester equipment manufacturer.

1-02 MANUFACTURER

A. All equipment specified herein shall be an integrated system which shall be the product of one (1) manufacturer who will provide single source responsibility for all components. The specific equipment described herein and shown on the plans is manufactured by CONTINENTAL BLOWER, L.L.C., or of equal manufacture as approved by the Contracting Officer.

Should equipment other than that specified be proposed, the Contractor shall be responsible for any redesign based on the requirements contained herein.

1-03 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures.

PART 2 - PRODUCTS

2-01 GENERAL REQUIREMENTS

A. The centrifugal blower housing shall consist of an inlet head designed to direct air to the inlet of the first impeller; an outlet head designed to eliminate friction, and multiple intermediate sections.

The heads are to be provided with integral mounting feet. The entire assembly shall be securely held together with multiple tension tie-rods which bind the entire housing into a solid integral unit.

- 1. Inlet and Outlet Heads: Heads shall be 125# ANSI flange connection (12") and be Cast iron ASTM A-48 Class 35B or equivalent. The minimum wall thickness shall be 0.31". The heads shall be supplied in various flange positions relative to the vertical centerline.
- 1. Intermediate Sections: Each Intermediate section shall be cast in one piece and be of cast iron ASTM A-48 Class 35B or equivalent.

- 2. Bearing Housing: The outboard bearing housings shall be cast iron, externally mounted, and not in contact with the air stream to ensuring cool operation. Bearing housings shall be cast iron ASTM A-48 Class 35B or equivalent and be heat treated to relieve internal stresses and minimize distortion. Bearing housings shall have cast fins to improve rigidity and increase heat dissipation and a labyrinth type oil seal with oil passages that are generously sized to allow optimum recirculation.
- 3. Bearings: The rotor assembly shall be supported by 2 heavy duty oil lubricated ball bearings, single row, sized to withstand the thrust load, SKF or FAG. Bearings shall be quality classification ABEC-1/C3 high temperature; noise classification E (extra quiet); sized for 10-year life (B10) as defined by AFBMA standards; and mounted in outboard type bearing housings and located so that the bearings may be serviced without disassembling the blower casing or piping. The bearings shall be oil lubricated.
- 4. Shaft: The blower shaft shall be AISI 1038 carbon steel shaft or equivalent, heat treated, straightened, and stress relieved. The complete shaft is ground and polished and of a stiff shaft design to minimize vibration. Shaft sealing shall be accomplished utilizing double graphite rings composition THERMOFLON, PTFE with lubricant.
- 5. Impellers: Impellers shall be one piece cast aluminum ASTM 360 aluminum alloy or fabricated ASTM 5754 aluminum alloy fixed on a rigid cast aluminum hub, precisely balanced, securely keyed to the shaft and held in place by lockwashers and locknuts.
- 6. Casing Assembly: The blower casing shall be a vertically split assembly with heads and sections having machined male and female joints to maintain concentricity. Joints are made gas tight with silicone sealant.
- 7. Rotor Assembly: Impellers and spacers are to be held together axially by a conventional locknut assembly. All impellers shall be keyed to the shaft using a staggered key arrangement. The rotor assembly is dynamically balanced on a computerized balancing machine.
- 8. Vibration: Vibration tolerance shall be 1.25 mils peak to peak. Vibration shall not exceed 1.25 mils when measured in the vertical plane at the bearing housings with the blower operating at the design speed.
- 9. Performance: All tests shall conform to the ASME Power Test Code and shall extend from surge to 120% of design volume. ASME tests shall include the determination of the surge point and verification of the guaranteed points. Test and calculation horsepower tolerances shall not exceed +/- 4%.

10. Accessory Items: All necessary accessory items shall be furnished as part of a packaged system by the Equipment Manufacturer including, but not limited to, air filters, butterfly valves, and expansion joints. The required accessory items shall be closely coordinated with the Aerobic Digester Manufacturer to ensure all system requirements are included to furnish a fully functional and operational blower package. All control functions of the centrifugal blower package shall be integrated into the control system of the Aerobic Digester.

PART 3 - EXECUTION

3-01 INSTALLATION

A. Manufacturer's Instructions: The centrifugal blower system shall be furnished complete by the manufacturer and shall be assembled, erected and installed by the General Contractor as directed by the manufacturer in his working drawings and written instructions and as directed on the site during inspection visits by the manufacturer's representative.

DIVISION 15 - MECHANICAL

SECTION 15395

POLYMER SYSTEM

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SECTION 15395

POLYMER SYSTEM

PART 1 GENERAL

1-01 DESCRIPTION

- A. The polymer system shall be USFilter/Stranco Model M2400-D10AA or equal as approved by the Contracting Officer.
- B. Equipment included with the polymer system includes:
 - 1. Mixing Chamber
 - 2. Dilution water controls
 - 3. Neat polymer pump
 - 4. System Controls

1-02 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 – Submittal Procedures.

PART 2 PRODUCTS

2-01 SYSTEM DESCRIPTION

- A. Multi-Zone Mixing Chamber
 - 1. Polymer and water shall be mixed in a chamber designed to create sufficient mixing energy.
 - a. This design shall include a motor-driven impeller that will create high fluid sheer.
 - b. Solution shall undergo a tapered mixing intensity slope as it exits the initial sheer zone and passes through a second zone, isolated by a baffle.
 - c. Polymer activation efficiency shall be consistent over the dilution water range.
 - 2. Mixing chamber shall be transparent to allow viewing of mixing intensity.
 - 3. Impeller shall be driven by a 1 HP maximum washdown duty motor.
 - a. Motor shall be TENV or TEFC.
 - b. Impeller speed shall be 3450 rpm, minimum.
 - c. Motor shall be direct-coupled to impeller shaft.

B. Dilution Water Control

- 1. Dilution water shall be split into two streams. Primary water flow shall supply the mixing chamber.
 - a. Secondary water flow shall be used to post dilute the activated polymer stream.
 - b. These two streams shall be completely blended by a static mixer prior to exiting the unit.

- 2. Unit shall have an electric solenoid valve for on/off control of total dilution water flow.
- 3. Flow indicators and flow control valves shall be provided for each dilution water stream.

C. Pump

- 1. Unit shall have a neat polymer metering pump.
 - a. Pump shall be positive displacement, diaphragm type.
 - b. Polymer pump head shall be fabricated of clear acrylic and shall have a priming port.

D. Controls

- 1. Unit shall be powered through an on-off-remote circuit controlled by a three-position switch.
 - a. In the remote switch position, the unit shall accept a run signal. Unit is manually powered in the on position.
- 2. Unit shall accept a 4-20 mA analog signal to pace the polymer metering pump.
 - a. This signal shall be processed by a pump controller that may be mounted remotely.
 - b. The controller shall have an LCD readout of pumping strokes per minute (or hour), a stroke frequency 10-turn potentiometer for local pump control and a three-position switch (internal-off-external) for pacing signal selection.
- 3. Unit shall have a dilution water loss of flow sensor which, sensing that water flow has been interrupted for any reason, will place the polymer pump on standby and will restart it automatically when flow is restored.
- 4. An integral timer shall monitor loss of flow and energize contacts indicating alarm after 15 seconds of continuous loss.

2-02 TECHNICAL DATA

- A. Connections Plumbing
 - 1. Dilution water inlet, 1½" FNPT
 - 2. Neat polymer inlet, ½" FNPT
 - 3. Solution discharge, 1½" FNPT
- B. Connections Electrical
 - 1. Standard, grounded male plug 120 / 1/60, 15 amps
 - 2. Terminal blocks 4-20 mA signal input
 - 3. Terminal blocks dry contact input for remote start
 - 4. Terminal blocks dry contact alarm output
 - 5. Terminal blocks dry contact run output
 - 6. Terminal blocks control switch status output

C. Dimensions

1. Frame – 36" wide x 16" deep x 40" high (92x41x102 cm)

- D. Materials of Construction
 - 1. Structural frame 304 stainless steel
 - 2. Plumbing PVC
 - 3. Mixing chamber PVC, acrylic
- E. Performance
 - 1. Dilution water 120-1200 gph primary mixing (456-4560 LPH) 120-1200 gph post dilution (456-4560 LPH)
 - 2. Metering pump 0.5-10.0 gph neat polymer (1.9-38.0 LPH)

PART 3 EXECUTION

3-01 INSTALLATION

A. The equipment shall be installed per the contract documents and manufacturer's recommendations.

3-02 WARRANTY

- A. Polymer feed system shall be warranted for a period of 12 months from the date of start-up by authorized technician.
- B. Damage due to makeup water particulates will not be considered as a warranty defect and will be the responsibility of the owner.
- C. In addition, supplier shall warrant the system to operate in accordance with owner's expectation and performance.

DIVISION 15 - MECHANICAL

SECTION 15396

AEROBIC DEGESTER

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SECTION 15396

AEROBIC DIGESTER

PART 1 - GENERAL

1-01 SCOPE OF WORK

A. This specification shall govern all work necessary to furnish, install and place into initial operation the equipment in the Digester Complex and related items as shown on the Drawings and as specified herein. The Digester Complex shall consist of a PreMix basin, Gravity Thickener and two (2) Aerobic Digester Basins in the configuration shown. The thickener, skimmer, decant, aeration system, airlift pumps, and controls will form an integrated system designed to provide both adequate oxygen transfer and mixing, and to continually thicken the waste sludge produced by the main process upstream.

1-02 MANUFACTURER

- A. All equipment specified herein shall be an integrated system which shall be the product of one (1) manufacturer who will provide single source responsibility for all components. The specific equipment described herein and shown on the plans is Model PAD-G-44 by ENVIROQUIP, INC. or equal as approved by the Contracting Officer.
 - Should equipment other than that specified be proposed, the Contractor shall be responsible for any redesign based on the requirements contained herein.
- B. The air diffusion equipment must be designed to meet or exceed the specified oxygen transfer requirements, must adequately mix the contents of each basin and must require little or no maintenance to continuously meet these requirements. The aeration manufacturer must have been in the business of supplying aeration systems for at least twenty (20) years.

1-03 MANUFACTURER'S SERVICES

- A. Technical Representative: The manufacturer shall furnish the services of trained technical representatives as needed to provide for a satisfactorily operating system. Services shall include not less than 2 trips and 4 days on the job for inspection and supervision during installation and for final check out of equipment installation prior to start-up. The Contractor shall install all equipment in exact accordance with the manufacturer's written instructions and as directed on the jobsite during inspection visits by the manufacturer's technical representative.
- B. Certification: Within ten (10) days after the final inspection of the completed installation, the manufacturer's representative shall furnish a detailed report jointly to the Contracting Officer and Contractor which shall list any deficiencies and recommend corrective action for each deficiency. Upon completion and inspection of any corrective action required, the manufacturer shall furnish a letter certifying that the equipment is now properly installed and ready for operation and beneficial use by the

Contracting Officer.

1-04 SUBMITTALS

- A. Approval Submittals: All equipment and materials shall be new and shall be specially designed or selected for the function and service specified. No equipment or materials may be used in the project that has not been approved by the Contracting Officer. Final approval for incorporation into the project will be made only after the review of shop drawings, specifications and data as required below:
 - 1. Shop drawings complete with all dimensions, size and location of anchor bolts, openings required in structures, details of connecting piping and the size and location of any required electrical conduits and conduit openings.
 - 2. Specifications for all mechanical and electrical components, and complete wiring diagrams for all electrical equipment.
 - 3. Details of the major fabricated components showing the arrangement of devices and labeled with member sizes and materials of construction.
 - 4. Details and catalog cuts of the major components, valves and devices.
 - 5. Manufacturer's recommended procedures for job site storage of equipment, handling and erection.
- B. Operation and Maintenance Manuals: Prior to delivery of equipment and updated as required during installation of the equipment, the manufacturer shall furnish complete and detailed installation, operation and maintenance manuals which shall include the following information as a minimum requirement:
 - 1. Name, address and phone number of nearest competent service organization who can supply parts and service.
 - 2. Complete descriptive literature and drawings of all material furnished. This is to include "as built" wiring diagrams of all electrical equipment, "as built" erection drawings providing up-to-date information on the actual construction of the equipment furnished and any field modifications made during installation, start-up and testing.
 - 3. Installation, operation and maintenance brochures from the original manufacturers of all mechanical components such as valves, couplings, etc..
 - 4. All required assembly, installation, alignment, adjustment and checking, operation and maintenance instructions as well as "guide to trouble shooting" and recommended spare parts list.

1-05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Preparation for Shipment: All pieces shall be delivered in the largest pieces practical for field assembly by the Contractor. Individual pieces shall be permanently tagged with welded erection marks or stainless steel tags cross referenced with information on the manufacturer's erection and assembly drawings. Mechanical and electrical components shall be protected from the weather and suitably packaged to facilitate handling and storage. All mechanical and electrical equipment shall be kept thoroughly dry at all times and shall be stored indoors.
- B. Storage of Equipment: All equipment stored on the job shall be protected and maintained in accordance with the manufacturer's recommendations. Electrical equipment must be stored in weatherproof, ventilated enclosures. Structural materials may be stored outdoors on pallets or other wooden supports providing for the proper support and drainage. Equipment shall not be allowed to contact the ground directly.
- C. Off Site Storage: The equipment manufacturer shall maintain storage facilities for completed equipment such that, in the event that proper storage facilities are not available on the jobsite, the manufacturer and Contractor will have the option of storing finished goods off site for delivery to the project within two weeks notice from the Contractor.

1-06 DESIGN REQUIREMENTS

A. The air distribution and air diffusion equipment must be able to distribute the design and maximum airflows to each basin. Air diffusion and piping systems must be capable of handling 150% of design airflows within the pressure limits indicated herein.

1. Airflow Distribution Requirements:

Basin	Design Airflow	
Aerobic Digester 1 & 2	1850 scfm each basin	
PreMix	240 scfm	

- B. The intent of these specifications requires that the air diffusion equipment must be capable of meeting the maximum pressure limitations for the lifetime of the project. The equipment manufacturer shall guarantee that the maximum increase in diffuser back pressure at the maximum airflows specified shall not exceed 0.1 PSIG after one year of operation and 0.2 PSIG after five years of operation.
- C. Before the aeration equipment is placed in continuous operation, the equipment manufacturer will provide initial baseline pressure loss data for the maximum head loss increase requirement above.

1-07 GUARANTEE REQUIREMENTS

- A. The air distribution and air diffusion equipment must be able to distribute the design and maximum airflows to each aerated basin as included in the table above. Air diffusion and piping systems must be capable of handling 150% of maximum airflows within the maximum pressure limits stated herein.
- B. The diffuser will be capable of producing a clean water standard oxygen transfer efficiency of 11.0% minimum at the diffuser submergence proposed. Clean water transfer efficiency shall be substantiated by in-situ testing and reports shall be furnished upon request by the Contracting Officer.
- C. The air diffusion equipment must be capable of supplying maximum airflows within the maximum pressure limitations imposed by the air supply and distribution systems.
 - 1. Maximum allowable air pressure in the process air headers at the maximum airflows indicated in the table above, and average water depths at start-up: 7.5 PSIG (upstream of diffuser orifices).
 - 2. The equipment manufacturer will demonstrate uniform air delivery to all diffusers at design airflow rates and at minimum pressure requirements.
- D. The air distribution system furnished shall be capable of handling a 2:1 turndown on the air supply system (from maximum rates) without back-pressuring the air blowers by more than 0.50 psig above the base line pressure.
- E. The equipment manufacturer shall be solely responsible for proper design of the air diffusion orifices to provide uniform air distribution to suit design requirements with minimum pressure losses, for demonstration of same on plant testing and start-up, and for correction of any deficiencies in air distribution caused by incorrect orificing of individual diffusers or improper pipe or tube sizing.
- F. All parts of the individual drop pipe and diffuser assembly shall have a <u>five (5) year</u> <u>warranty</u> against mechanical failure beginning at the date that the aeration equipment is place in operation.

PART 2 - PRODUCTS

2-01 GENERAL REQUIREMENTS

- A. General Design: The equipment to be furnished shall include all required items to provide the necessary air for mixing and process purposes. The equipment shall be capable of functioning as intended for flow rates indicated in the specification. The aeration system consists of low headloss air diffusers suspended from individual drop pipes using above water orifices. No under water orifices or restricting devices will be allowed. The depth of submergence and basin sizes are shown on the drawings.
- B. Structural Steel Fabrication: Except where specifically stated otherwise, all carbon steel plate and structural members shall have a minimum material thickness of 1/4".

Pieces shall be fabricated in maximum sizes suitable for shipping and galvanizing. The equipment shall be designed and fabricated per ASTM A-143, A-384 an A-385 for bolt together field assembly. All welding shall conform to the latest AWS Standards and shall be performed by certified welders. All welding shall use a minimum of 3/16" fillets, and shall completely seal all mating surfaces. Skip welding will not be allowed. All field connections shall be bolted connections designed to resist all static, live and erection loads. Field welded assembly will not be allowed.

- C. Hot Dip Galvanizing: All fabricated carbon steel components shall be designed and fabricated per ASTM A-143, A-384 and A-385 for bolt-together field assembly and shall be hot dipped galvanized after fabrication in accordance with ASTM A-123. Minor defects in the hot dipped galvanizing coating caused by shipping, handling or installation shall be repaired after equipment installation. The defects shall be thoroughly cleaned and wire brushed to remove all foreign substances, wiped clean with a suitable solvent, thoroughly dried, and coated with at least 3 mils of a zinc rich compound specifically formulated for touch-up of galvanizing and conforming to USN Specification MIL-P-21035 or USAF Specification MIL-P-26915A.
- D. Anchorage and Fasteners: All anchors shall be stainless steel with stainless steel nuts and washers. All fasteners attached to stainless steel shall be Type 304 stainless steel. All other fasteners shall be hot dip galvanized. The equipment manufacturer shall furnish all anchor bolts, nuts, washers and gaskets necessary for the equipment furnished, as well as any templates required for setting the anchorage. The Installing Contractor shall place the anchorage in accordance with certified prints supplied by the equipment manufacturer. All anchor bolts shall be set with proper projection.

2-02 CONSTRUCTION AND MATERIALS

- A. Air Diffuser Assemblies: Individual air drop assemblies each consisting of an easily replaceable above water air control orifice, stainless steel tee and run-out nipple, drop pipe, clamp, and non-clogging air diffuser shall be furnished as indicated. The air drop assembly furnished and each individual component must have a minimum twenty (20) year proven history of efficient operation, free from clogging, back pressuring, or structural failure, when applied to service conditions similar to those indicated for this project. The manufacturer shall also be responsible for the proper orificing of the individual drops to achieve balanced air flow to each diffuser. Orifice sizing shall provide at least 3" of water column back-pressure at minimum airflow to assure proper distribution.
 - 2" Diffusers: The diffuser assembly shall be 2" MS as manufactured by ENVIROQUIP, INC. or equal as approved by the Contracting Officer. Diffuser assemblies shall have no moving parts. Diffusers shall be pressure injection molded of black pigmented ABS (Acrylonitrile-Butadiene-Styrene) plastic, having a temperature tolerance range of 220 to 245 F. Material must be an exceptionally high heat resistant compound combining high impact characteristics and retention of mechanical properties at elevated temperatures. The diffusers must be of proven design without inherent structural deficiencies or weaknesses. Air bubbles shall be generated by a hydraulic shearing action at the diffuser shear edge and not by any underwater orificing. No air diffusion

equipment using underwater orificing or restricting devices will be accepted. The surface contours of the diffuser shall be formed to enhance the shearing action. Diffusers shall be constructed with a 2" inlet diameter and a vertical hollow section of the same diameter extending from the inlet through the bottommost point of the diffuser to provide for minimum pressure losses and maximum cleanout capability. The connection between the drop pipe and the diffuser shall be male threads on the drop pipe to a female threaded bushing on the diffuser.

- 2. Orifices: The airflow to each individual drop pipe shall be regulated by an above water orifice that shall be inexpensively interchangeable when future airflow adjustments become necessary due to changes in process design parameters. The orifice shall be molded of high temperature, black pigmented, glass reinforced nylon suitable for extended outdoor application in extreme heat and wastewater environments. No part of the orifice shall be made of brass, PVC or CPVC. The orifice assembly shall screw into the top of the vertical 304 stainless steel tee fitting and shall be easily removable for positive cleaning of the drop pipe and diffuser. The air drop assembly shall be capable of being positively cleaned in-place without dewatering the basin. No diffuser utilizing small underwater orifices for either bubble formation or air distribution will be permitted.
- 3. Above Water Tee Assemblies: The removable nylon orifice fitting shall assemble into the top position of a type 304 stainless steel tee forming a plug. The tee assembly shall attached to the air supply threaded nozzle through a horizontal Schedule 40 type 304 stainless steel runout and to the vertical air drop.
- 4. Air Drops: An individual air drop (air feed pipe) shall be furnished for each air diffuser assembly. Each drop shall be connected to the air supply manifold by a stainless steel run-out nipple and orifice/tee assembly and shall be supported below the water surface with a structural angle support and clamp as described below. Individual air diffuser assemblies must be positively and securely fixed in place at the proper elevation and must be capable of being individually and positively cleaned from above the water surface without being removed and without draining the basin. Each 2" air drop shall be 2.375" O.D. Schedule 40, Grade 18-8, ASTM Type 304 Stainless Steel welded seam pipe.
- 5. Support System: Supports for air drops, shear tubes, and air headers shall be provided as shown on the Plans. Supports for shear tubes, air headers and AirBridges shall be fabricated from carbon steel structural shapes and plates, minimum 1/4" thickness. Each drop pipe shall be rigidly secured in place by the above water orifice-tee assembly and by an intermediate structural support fabricated from ¼" thick carbon steel angle with a vibration resistant clamp block for each drop pipe. All fabricated carbon steel support systems shall be hot dip galvanized after fabrication. The clamp block shall consist of two halves molded from black pigmented filled polypropylene. The clamp block shall be retained with two (2) 10 gauge Type 304 stainless steel backing plates and

stainless steel bolts.

- 6. Access AirBridges: Access AirBridges shall provide convenient access to the air drop assemblies and provide a conduit for the airflow to the air drops. AirBridges shall be fabricated from standard rectangular steel tubing with a minimum ¼" wall thickness and interlaced with 3" x 3" x ¼" angles. Each air bridge section shall be hot dip galvanized inside and outside after fabrication. AirBridges shall include standard, two rail, aluminum handrail, toe plate and ¼" x 1¼" hot dip galvanized grating with 1" clear openings. The handrails shall include 1.900" O.D. minimum schedule 10 rails, minimum schedule 40 posts and cast aluminum fittings with the top rail 42" above the grating. The AirBridge tubing shall be sized so that the velocity of the air in the tubing at 150% of the design airflow is less than or equal to 3,000 fpm for tubing up to and including 6" x 12" and 4,000 fpm for tubing larger than 6" x 12". The structural design of the AirBridges shall be based on all dead loads plus a live load of 50 psf with a maximum deflection less than L/360.
- 7. Air Supply Piping: All air supply piping headers shall be fabricated of ¼" wall thickness carbon steel pipe and shall be hot dip galvanized inside and outside after fabrication. The air supply and air header piping shall be sized so that the velocity of the air in the pipe at 150% of the design airflow is less than or equal to the values in the following table.

Pipe Size	Velocity, fpm		
1" - 3"	1,800		
4" - 10"	3,000		
12" - 24"	4,000		
> 24"	6,500		

- 8. Air Control Valves: Each air header shall include a control valve as shown on the drawings. Butterfly valves shall be used for air control and shall be General Service Butterfly Valves, as manufactured by DeZurik or approved equal. Butterfly valves 8" and larger shall have handwheel actuators. Air control valves 2" and smaller may be plug type valves.
- B. Thickener Mechanism: The work included in this section of the specifications consists of furnishing and installing one (1) new pier supported sludge thickener detailed to fit the thickener basin as shown on the plans. This equipment shall be constructed such that all rotating elements of the mechanism shall be supported above the water surface. The unit furnished shall include a stationary center pier supporting a turntable drive and access bridge with a rotating drive cage supporting the flight arms, influent baffle, slotted pipe skimmer, scum spray system, and effluent trough with weirs and scum baffle.
 - 1. Structural Design: Design loading for the structural analysis of the drive cage, flight arms, and center pier shall be taken as all dead loading resulting from the weight of all rotating equipment, plus a live load equal to 2.5 times the

continuous output torque rating of the spur gear drive. The maximum allowable combined stress in any member at this loading shall not exceed 20,000 psi. Structural design of the mechanism and access bridge including allowable stresses and slenderness ratios where applicable shall be in accordance with the American Institute of Steel Construction Specification for Steel Buildings, latest edition.

2. Drive Mechanism: The center drive assembly mounted to the center pier shall consist of a cast iron turntable base with ball race, and an internal forged steel spur gear designed such that the gear, bearing balls, and raceways can be removed for service or replaced without removing the access bridge, gear housing, or disconnecting the drive cage and anything attached thereto from the drive assembly. All repairs or replacement of drive components can be performed without dewatering the collector basin or disrupting the flow through the basin. All work should be performed with the aid of only a portable hoist with no more than a one-ton capacity. This disassembly procedure shall be demonstrated to the Contracting Officer during the operator training of the clarifier equipment. Additionally, a VHS video describing the process shall be delivered to the Contracting Officer. The video will become the property of the Contracting Officer. Replacement of the clarifier main internally cut spur gear and main bearing, including the labor and crane time, shall be the responsibility of the clarifier manufacturer for the first ten years of operation if the failure is due to poor quality materials, workmanship, or material fatigue under normal design operating and non contaminated conditions.

The main gear shall be an internal cut spur gear which shall be of AISI 1045 forged steel, hardened to 280 to 320 BHN, having a 99,000 psi yield strength. The main gear shall have teeth with a diametral pitch and length to produce up to 43,000 ft.-lbs. continuous operating torque as calculated by AGMA 2001.88B. The gear shall have a minimum 35.0" pitch diameter. The gear teeth shall be stressed to no more than the allowable bending stress at the continuous rated output torque. Life factors should be based on 1 million load cycles.

The main bearing shall have a 40" ball race diameter and 1¼" diameter chrome alloy balls with nylon spacers. The bearing balls shall run mostly submerged in an oil bath protected by dust seals and condensate drain. The bearing balls shall be of Type 52100 steel hardened to 60/66 Rc. The bearing balls shall rotate in a full circle four-point contact raceway having a 60-degree contact angle for the transfer of large thrust and overturning moment loading. The raceway shall be induction hardened to 60 Rc for a depth of 3/16" and ground to shape. A separate circular cast iron load and torque transfer ring with heavy cast iron mounting pads for the drive cage shall be bolted to the inner rotating race of the gear-bearing. Each of the four mounting pads shall have provision for four fasteners.

The main gear housing shall be a heavy casting of high strength Class 40B gray iron. The housing shall be adequately proportioned and stiffened to support the entire rotating weight of the mechanism, the access bridge, and all possible dead and live loads anticipated for the life of the equipment. The housing shall be

circular in shape to conform with the general geometry of the spur gear bearing and load plate, and shall provide a containment for the oil bath lubrication of the spur gear and bearing.

The main gear housing shall be fitted with oil fill ports and an oil level dip stick. Two drains shall be provided to assure the complete removal of spent oil and condensate from the housing. One drain shall be fitted with a condensate drain assembly. The center opening of the housing shall be fitted with a removable steel floor plate for access to the oil and condensate drain. The main housing shall also be fitted with a minimum of eight mounting/leveling bolts, 1" in diameter.

The spur gear shall be driven by an internal pinion. The pinion shall be machined from AISI Type 4140 alloy steel, quenched and tempered to 350 to 400 BHN hardness. The pinion shall be keyed to and driven by a low speed shaft mounted between bearing assemblies to offset the overhung load produced by gear meshing.

The intermediate gear reducer housing shall be constructed of SAE Class 30 gray cast iron. Gears shall be manufactured from case hardened steel and hardened to 58-62 Rockwell C. All gear teeth are shaved or ground to ensure accurate tooth profile. Minimum 95% gear efficiency shall be achieved regardless of ratio. The bearings shall be of ABEC-1 tolerance class. The shafting shall be of SAE 1045 steel or equivalent. The shaft seals shall be of Nitrile (Buna-N) rubber with double lip on the output seal. The reducer shall be rated for continuous duty at the mechanical capacity and shall not be thermally limited. The gearbox shall be designed with a high cross section modulus and a center wall for maximum rigidity. The gear reducers shall be provided with stainless steel nameplates. The reducers shall be AGMA rated to provide a maximum Class 1 output torque required to achieve the required continuous operating torque. The reducer output shaft shall be direct coupled to the drive pinion with machined slip fit tolerances to effectively provide a continuous pinion shaft through the intermediate drive unit.

The primary gear motor shall be constructed to the same specifications as the intermediate reducer with the exception of the integrally mounted motor and the hollow output shaft.

The motor shall be 3 phase TEFC, with NEMA B characteristics. It shall be rated for continuous duty at nameplate rating meeting electrical standards per NEMA publication MG1. The conduit box and output shaft end shield/flange shall be of SAE Class 30 gray cast iron. The motor shall have Class F winding insulation with Mylar phase separators and slot liners. The stator shall be copper wound. The motor shall have an oil seal at the shaft end shield and V-ring at the fan end shield. The motor shall have double sealed or shielded bearings lubricated for life. The motor shall be fitted with stainless steel nameplates. The motor stator shall be made of corrosion resistant aluminum alloy (Silafont-13). The internal surfaces, including stator bore, windings, end shields, and conduit box shall be coated with Dolph's Spray ER-41, Class F

polyurethane red insulator. The end shields and conduit box shall be sealed at the joints. Fastener hardware shall be plated or stainless steel. The motor shall be painted with corrosion resistant paint. The motor shall be rated for a 1.15 service factor.

A spring loaded torque arm shall be attached to the secondary reducer to restrict rotation of the primary reducer about the secondary reducer. The compression imposed upon the spring shall be proportional to the amount of torque transmitted between the primary and secondary reducers. The torque arm shall be fitted with adjustable, magnetically actuated proximity switches to signal alarm or shut-off when the load torque reaches a designated value. The alarm value is 80% of the continuous output torque and the shut-off value is 100% of the continuous output torque.

In addition to providing signals at specific load torque set points, a continuous torque readout, as a percent of full load, shall be provided by a mechanical scale and pointer integral to the torque arm. The torque monitor unit shall be suitable for outdoor service including stainless steel or plated internal ports for corrosion resistance. The components shall be intrinsically safe for hazardous locations.

The complete spur gear drive assembly shall rotate the rake arm at a tip speed of approximately 8 to 12 ft/min with the drive cage and rake arm assembly designed to withstand approximately twice the design torque of the drive unit. The design torque capabilities of the drive assembly clarifier mechanism will be based on a 40 lb./ft. arm loading factor multiplied by the squared radius of the clarifier basin, or 19,360 ft/lbs continuous out put torque.

A size 1 motor starter with motor circuit protector, main disconnect switch, thermal overload protection, alarm and shut-down contacts and wiring, alarm light w/horn, on/off switch w/run light, and alarm reset button all mounted in NEMA 3R enclosure will be provided.

3. Center Pier: The manufacturer shall provide a circular steel center pier. The top of the center pier shall provide a stable and accurate surface upon which the main gear may be mounted. The center pier shall support the main gear, access bridge, and the entire weight of the rotating mechanism.

The center pier shall be constructed of minimum 3/8" thick steel plate or steel pipe. The pier shall be provided with minimum 3/4" thick steel plate top and bottom flanges. The top flange shall have mounting holes matching the main spur gear drive. The bottom flange shall provide for the center pier anchorage. The required anchorage shall be selected and provided by the equipment manufacturer; however, as a minimum, eight 1" diameter anchor bolts shall be provided.

4. Drive Cage: The center rotating drive cage shall be supported and driven from the turntable type main spur gear and shall be of heavy duty construction throughout. The lower portion of the drive cage shall provide attachment for the two flight arms and the upper end shall connect to the drive gear with four drive

cage hangers. The drive cage shall be completely supported and stabilized by the main bearing. No below water supports, bearings or bumpers will be allowed.

- 5. Flight Arms: The thickener mechanism shall have two full length box truss collector arms with helical flights arranged to sweep settled sludge to sludge hopper located in the center of the basin. The flight arms shall be fitted with vertical pickets to agitate the sludge blanket. The flight arms shall be cantilevered box trusses fabricated from minimum 2" x 2" x 1/4" mill formed structural steel angles. Cold formed members will not be allowed. The flight arms shall be rigidly connected to the central rotating drive cage and shall not require tie rods or secondary bracing for support. Overlapping 40 degree diagonal flights on the arms shall be a minimum of 6" deep and shall be fabricated from 1/4" thick structural steel plate. Adjustable squeegees shall be provided of 26-gauge brass and shall be attached with ½" diameter stainless steel bolts in slotted holes on a maximum of 18" centers. Steel washers shall be provided for both sides of the connection. The flight arm truss shall be capable of withstanding the loads described in Section F-1 and F-5.
- 6. Access Walkway: A fixed access bridge, walkway and service platform 8' square shall be furnished to provide access to the center drive assembly. The bridge shall span the thickener tank and shall be supported at the tank walls and the center pier.

The bridge shall consist of two structural steel wide flange beams interlaced with steel angles for rigidity. Structurally, the bridge shall be designed such that the maximum deflection shall be limited to 1/800 of the span, with all dead loads plus a live load of 50 lbs/ft² on the walkway. The manufacturer shall be responsible for sizing the bridge members to meet these requirements; except, that the members specified are the minimum acceptable. Slide plates shall be provided at the thickener side walls to allow for thermal expansion. The slide plates shall be a minimum of ½" thick steel plate. The bridge shall be provided with a minimum 36" wide walkway designed to allow for an uninterrupted passage along its entire length. The access walkway shall consist of hot dipped galvanized steel grating sections, 1-1/4" x 3/16" x 1" clear openings. Aluminum handrails assembled from 1-1/2" nominal size aluminum pipe shall be provided for both sides of the access bridge. The railing shall be a two rail system with the top rail located at 42" above the deck. Vertical posts shall be Schedule 40 and horizontal runs shall be a minimum of Schedule 10. Sections shall be field assembled with cast aluminum fittings. A service platform shall be provided to allow easy maintenance of the spur gear drive. The platform shall be a minimum of 8'-0" square with aluminum handrails, galvanized checkered floor plate flooring and a ¼" thick by 4" high aluminum kickplate.

7. Center Hopper Agitator: A central agitator shall be provided at the base of the torque tube and shall be detailed to fit within the concrete sludge hopper with a maximum of 3" clearance.

- 8. Influent Well: The influent well shall be furnished in segments for field bolted connections. The influent well shall be sized per equipment drawings. Field splices shall consist of overlapping splice plates on the vertical seams or vertical flanges and splice bars at the top and bottom trim angles. The top and bottom trim rings shall be minimum 2.5" x 2.5" x 1/4" carbon steel angles. The influent well shall be supported by and rotate with the drive cage. Necessary supports shall be provided to support the inlet well and maintain 4" freeboard of the top trim angle to ± 1". There shall be four 1 foot long scum ports located at the water surface with adjustable scum weirs to allow scum to exit the influent wells.
- 9. Skimming: A device shall be furnished and fitted to the both collector arms, and shall skim the surface of the basin between the flocculating inlet well and the effluent scum baffle twice every revolution of the collector mechanism. The skimming device shall consist of a pivot arm wiper, and tangentially mounted skimmer blade.

The skimmer blade, pivoting scum wiper, and supports shall be fabricated from HDG carbon steel. The blade shall extend from the influent feed well to near the scum beach to a support and pull the pivoting wiper blade.

The pivoting wiper blade shall be fixed to the skimmer arm and shall remove scum from Thickener water surface. The pivoting wiper blade shall be designed and constructed to wipe the scum baffle at all times and to fit into and ride over the ramp scum collector box. The pivoting blade shall be fabricated from stainless steel with neoprene wipers on the bottom and both ends. The blade shall be supported on two pivoting arms pivoting on minimum ½" diameter steel locking fasteners and by the skimmer support. The pivoting wiper and arm assembly shall be adjustable in all directions to insure ease of field assembly. The neoprene and nylon brush wiper on the pivot blade shall contact the scum baffle at all times. The pivoting wiper blade shall ride up and over the ramp scum collection box depositing the scum in the scum trough.

A ramp scum collection box shall be provided as shown on the plans. The ramp scum collector shall consist of a scum trough with an outlet nozzle, an approach ramp, an integral scum baffle section, and supports. The scum box and ramp shall be designed and arranged for effective and positive scum removal and transport.

a. The scum ramp shall be a flat carbon steel plate beginning underwater and sloping gently upward out of the water to its juncture with the scum trough. The ramp and trough shall be bound on the outside by a fabricated steel plate that also serves as the scum baffle section in that location. An inner sidewall shall also be provided on the ramp and shall extend out two feet past the submerged edge of the ramp. The entire ramp structure shall be designed to fit the contact angle of the rotating scum pivot arm so that the pivot arm wipers remain in contact with the ramp and both walls at all times.

- b. The scum trough shall extend the full width of the ramp, collecting and trapping the scum swept up the ramp. The trough shall have a hopper bottom, terminating in a down facing flanged nozzle for connection to the scum removal piping. The scum trough shall be complete with pivot arm rider bars to support the pivot as it passes over the trough, and an adjustable 6" wide flat crested weir to allow flushing water to enter the trough. The trough bottom shall have a 1" to 12" sloped bottom to the scum removal pipe.
- 10. Effluent weir plates shall be furnished for mounting to the reinforced concrete effluent troughs. Oversized holes 1-1/2" in diameter shall be provided in the weir plate to provide vertical and horizontal adjustment. The weir plates shall have 90-degree V-notches, by 2½" deep located on 6" centers.
 - a. The weir plates shall be fabricated from minimum fourteen (14) gauge thick by 9" wide AISI Type 304 stainless steel.
 - b. The weir plates shall attach to the concrete troughs with minimum ½" diameter drill-in anchors furnished with oversized washers and located at no greater than 18" on center.
 - c. A weir splice plate shall be provided 3" wide x 9" tall to cover each weir plate joint.
 - d. The weir will be leveled to within plus or minus 3/16" of the elevation shown on the drawings for the full circumference of the effluent trough. After leveling and tightening the gap between the bottom edge of the weir plate and the concrete will be caulked to prevent flow between the weir plate and the wall.
- 11. Scum Baffles: A circular scum baffle shall be furnished and shall be held in place by adjustable stainless steel supports mounted to the concrete troughs.
 - a. The scum baffles shall be fabricated of carbon steel plates a minimum of 12" tall. The scum baffle shall be positioned for a minimum of 4" of freeboard above the design water surface and 8" below.
 - b. The scum baffle shall be furnished in individual sections
- 12. Grout Ring: A steel grout ring shall be provided by the thickener manufacturer for mounting on the four walls of the thickener basin at an elevation to provide a 3" to 12" conical floor slope from the bottom of the grout ring to the top of the sludge hopper in the thickener basin. The top of the grout ring will provide a point for the bottom of the 60 degree slopped corner fillets.

- 13. Floor Grout: The sludge collector mechanism shall be detailed to allow clearance for a grout topping top be applied to the rough floor of the settling basin(s). The purpose of the topping is to provide a smooth uniform floor and a precision fit to the scraper blades. The grout topping shall be nominally 2" thick adjusted as required to fit the mechanism but in no case shall be less than 1" thick. The collector arms and rotating mechanism shall be carefully leveled and adjusted in accordance with the manufacturer's written instructions and as described in the field by the manufacturer's technical service personnel prior to placement of the floor grout. Grout topping is to be applied before installation of the flight squeegees. The sludge hopper and sludge draw-off pipe shall be carefully protected by plywood covers or sand bags prior to placement of grout.
- 14. Lubrication: Lubricants of the type recommended by the equipment manufacturer shall be furnished and applied by the Contractor. The Contractor shall certify that the collector drive system has received the proper amount of recommended lubricant.
- C. Controls: One (1) combination airlift and thickener control panel in NEMA 4X 304 stainless steel enclosure including circuit breaker, motor starter, control transformer, timers, relays, alarm light, and horn. The control panel shall provide manual and automatic control of PAD-G components including scum and thickened sludge airlifts, thickener scum spray system, and thickener drive. The General Contractor shall furnish 480v/3ph/60hz power to the control panel and shall be responsible for interconnecting wire and rigid conduit between the control panel and the devices it controls. The Aerobic Digester control panel shall incorporate all necessary control functions to effectively integrate the Centrifugal Blower package into a fully functional and operable Aerobic Digester system.
- D. AirLift Pumps: Each pump shall be furnished complete with Schedule 40 steel Eductor pipe, discharge nozzle, and suction piping all hot dipped galvanized after fabrication. The Eductor pipe shall be supplied with a flange or coupling, as shown on the plans, for attachment to the suction piping. Each pump assembly shall be rigidly supported in place by fabricated steel supports to be sized, located and furnished by the equipment manufacturer. Anchorage shall be 5/8" minimum galvanized anchor bolts.
 - 1. Design requirements: The airlift pump equipment shall be supplied as described below:

Description	Size	Control Type
Scum Airlift for Digester No.1.	6"	Automatic
Scum Airlift for Digester No.2	6"	Automatic
Thickened Sludge Airlift for Digester No.1	8"	Automatic
Thickened Sludge Airlift for Digester No.2	8"	Automatic

- 2. Piping: Each airlift air injection pipe shall be provided with a full pipe size diameter air control valve with indicator, a piping union, and a solenoid valve. The air injection pipe shall be stainless steel and shall extend down the center of the eductor tube, terminating with the air release point located at the proper submergence for optimum pumping efficiency. Air injection pipes shall be easily removable for inspection or maintenance.
- E. Sludge Transfer Weirs and Baffles: The manufacturer shall provide an effluent baffle with a weir plate for sludge transfer from each Digester to the Pre-Mix. It will be the manufacturer's responsibility to locate the top of the weir at the correct elevation so that sludge flow to the Pre-Mix will flow by gravity. The baffle and weir shall be 10 gauge type 304 stainless steel.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Manufacturer's Instructions: The aeration system shall be furnished complete by the manufacturer and shall be assembled, erected and installed by the General Contractor as directed by the manufacturer in his working drawings and written instructions and as directed on the site during inspection visits by the manufacturer's representative. Particular attention shall be made to the air diffusers which shall be installed level and to the exact elevation shown on the plans. Deviations from the manufacturer's written or verbal instructions shall be subject to approval by the Contracting Officer and manufacturer.
- B. Orifice Installation: Installation of the orifices in the tee at the top of each drop pipe shall be supervised by the Field Service Representative of the equipment manufacturer. The contractor will be responsible for installation of the orifices, however, the equipment manufacturer will be solely responsible for correct air distribution. If, with exception to this specification, the contractor elects to install the individual orifices without the manufacturer's supervision, the contractor will be solely responsible for correct orifice installation and correctly balancing the air distribution system.

DIVISION 15 - MECHANICAL

SECTION 15397

SHAFTLESS SCREW SLUDGE CONVEYOR

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SECTION 15397

SHAFTLESS SCREW SLUDGE CONVEYOR

PART 1 - GENERAL

1-01 SCOPE OF WORK

- A. This section covers furnishing three (3) shaftless screw conveyors for the conveyance of dewatered wastewater sludge from one (1) Belt Filter Press. The design of the equipment shall take into consideration the capability of transporting dewatered wastewater sludge from an additional two (2) Belt Filter Presses to be installed in the future. This consideration for future capability shall be by addition of future conveyors or modification of the conveyor system to be installed as a part of this Contract. The conveyor system shall be capable of conveying dewatered sludge at a rate of 900 cubic feet per hour.
- B. The shaftless screw conveyors shall be manufactured by a supplier with not less than 60 operating installations of shaftless screw conveyors in North America. The conveyor and shaftless helical screw shall be as manufactured by JDV Equipment or of equal manufacture as approved by the Contracting Officer.

Should equipment other than that specified be proposed, the Contractor shall be responsible for any redesign based on the requirements contained herein.

The Contractor shall provide the Contracting Officer with a written statement indicating that the conveyor manufacturer has at least 5 years experience in the construction and manufacture of shaftless conveyor systems incorporating the design features as herein specified.

The Supplier of the material and/or products included in this section undertakes and agrees to defend, at Supplier's own expense, all suits, action or proceeding brought against the municipality or it's Contractor(s) for actual or alleged infringement on any United States patent or foreign letters patent because or on account of the employment of sales of such material or products, and further agrees to pay and discharge any and all judgments or decrees which may be rendered in any such suit, action or proceeding against the defendants herein.

PART 2 - PRODUCTS

2-01 GENERAL REQUIREMENTS

A. Equipment furnished in this specification shall be fabricated and assembled in full conformity with this specification and as shown in the contract drawings. Each conveyor shall be furnished complete with all supports; all mechanical equipment required for proper operation, including complete drive units, all steel, iron, and other metal construction specified herein; and all additional materials or fabrication as required by the supplier's design. The Conveyor shall be designed to transport at least 930 cubic feet per hour of dewatered wastewater sludge cake.

All equipment included in this section shall be furnished by a single supplier who shall be responsible for the design, coordination, and the satisfactory operation of the system.

The shaftless screw conveyor equipment shall include, but not be limited to the following:

- 1. Spiral flighting
- 2. Troughs and Liners
- 3. ChutesCovers
- 4. End Shaft
- 5. Motor Reducer
- 6. Mounting and Support Structure
- 7. Safety Accessories.

2-02 POWER SUPPLY

A. Power supply to the equipment will be 480 volts, 60 Hz, 3 phase. Power supply for controls shall be 120 volts, 60 Hz, single phase.

2-03 ELECTRICAL EQUIPMENT

- A. All electrical equipment shall conform to applicable standard of the National Electrical Manufactures Association (NEMA) and the National Electrical Code (NEC). Both power and control equipment shall be insulated for not less than 600 volts even though operating voltages may be lower.
- B. All motors shall be totally enclosed, fan cooled (TEFC). Control panels shall be NEMA 4X, stainless steel.

2-03 FABRICATION

A. All welds shall be continuous unless otherwise specified. Facing surfaces of bolted joints shall be shop primed. Facing surfaces of field welded components shall be beveled and match marked.

2-04 EDGE GRINDING

A. Sharp corners of all cut and sheared edges shall be made smooth by a power grinder.

2-05 FASTENERS

A. All bolts, nuts, washers, and other fasteners shall be stainless steel.

2-06 SURFACE PREPARATION

A. All iron and mild steel surfaces to be painted shall be dry abrasive grit blasted to "near white metal" in accordance with SSPC-SP6 or SSPC-SP10, and in accordance with the painting section of these specifications. Grit blasted surfaces shall be painted within 24 hours to prevent rusting and surface discoloration.

2-07 PAINTING

A. After surface preparation, metal surfaces except for the spiral flighting shall receive a minimum of one coat of Tnemec "66-1211 Epoxoline primer" or equal, and one coat of "46H-413 Hi-Build Tnemec-tar" coal tar epoxy or equal, to provide a total minimum dry film thickness of 15 mils prior to shipment to jobsite. Stainless steel components shall be furnished unpainted.

2-08 MATERIALS

A. Unless otherwise specified or permitted, the materials used in the fabrication of the equipment under this section shall conform to the following:

Chutes AISI 304, ASTM A167, 18-8
Troughs, End Plates, Covers AISI 304, ASTM A167, 18-8
Supports AISI 304, ASTM A167, 18-8

Spiral Flighting High Strength Alloy Carbon Steel with a

minimum hardness of 250 Brinnell

Wear Liner Ultrahigh molecular weight polyethylene

sintered with antiwear filler and synthetic

lubricants(4.02.04B)

Bolts, Nuts, and Washers AISI 304, ASTM A167, 18-8

For Conveyor Supports

For Conveyor Trough, AISI 304, ASTM A167, 18-8

Lids, and Drive

2-09 SHAFTLESS SCREW CONVEYOR CONSTRUCTION

- A. Spiral flighting for the shaftless screw conveyors shall be designed to convey material without a center shaft. The minimum overall spiral weight and surface pressure shall be as specified herein. The conveyor will include an inner flight to increase axial strength and capacity of the conveyor. The minimum spiral weight shall be specified herein.
- B. Spiral flights shall be cold-formed high strength alloy steel with a minimum hardness of 250 Brinnell. The spiral flights shall be designed with the stability to prevent distortion and jumping in the trough. The torsional rating of the auger flighting shall be reached at 30% of the Fy value in the extreme fiber of the flight material. Supplier shall demonstrate that, at 250% of the motor nameplate horsepower, the drive unit cannot produce more torque than the torsional rating of the flighting, and that the "spring effect" of the spiral shall not exceed + 0.8 mm per meter of length at maximum load conditions.
- C. The spiral flighting shall be formed in sections from one continuous flat bar and shall be concentric to within 2mm +/-. Sectional flighting formed from plate shall not be permitted.
- D. Spiral flighting shall have full penetration welds at all splice connections. The flights shall be aligned to assure true alignment when assembled in the field and shall be made in accordance with the supplier's requirements. The spiral flights shall be coupled to the end shaft by a flanged, bolted connection.

- E. A gland packing ring consisting of two teflon coated packing rings shall seal the drive shaft at its penetration through the end plate.
- F. The connection of the spiral to the drive system shall be through a flanged connection plate that is welded to the spiral forming a smooth and continuous transformation from the flange plate to the spiral. The drive shaft shall have a mating flange and shall be bolted to the spiral connection plate. Additionally, a grease lubricated labyrinth seal shall be shaft mounted internally in the conveyor between the back plate and spiral coupling connection.

2-10 HORIZONTAL AND INCLINED TROUGHS

- A. Troughs shall be similar to the dimensional standards of CEMA 300 and enclosure classification IIE. Each conveyor trough shall be U-shaped, fabricated from a minimum 1/8 inch stainless steel plate.
- B. Stiffeners shall be placed across the top of the trough and fastened to both sides of the trough to maintain trough shape and act as a face seal for the covers; apply a continuous gasket, one half inch width, to the entire top face of the trough top flange and stiffeners.
- C. Each trough shall be equipped with filling and/or discharge openings as required by the contract drawings. If required, each filling and discharge opening shall be flanged suitable for interconnection to other devices. Any interconnecting devices such as chutes and hoppers shall be fabricated from the same material as the troughs.
- D. A flanged covered drain outlet shall be provided with each conveyor to facilitate cleaning.
- E. The portion of each trough that is not covered by the filling chute shall be covered by a bolted cover of a material identical to the trough. The covers shall be manufactured in maximum four foot length section to allow for access to the conveyors. To prevent unsafe access to the conveyors, quick opening covers will not be allowed.

2-11 VERTICAL TROUGHS

A. Vertical trough conveyors shall be provided where indicated on the contract drawings. Vertical troughs shall be of segmented construction to allow ready access to the conveyor internal for inspection, service, and cleaning. The trough shall be specifically constructed to prevent "wobble" and/or binding of the spiral during normal operation. Construction must allow free movement of the spiral, to prevent jamming or stalling. Maximum rotational speed shall not exceed 60 RPM and designed to prevent excessive vibration and dynamic imbalance. To prevent premature failure of vertical shaft seal, packing type seals will not be acceptable. A pneumatic or grease type compression seal with continual relief shall be supplied. If plant air is available, the contactor shall be responsible for hard piping the pneumatic lines to the seal. The seal shall rely on pressure to continually relieve air or grease toward the inside of the conveyor to prevent debris from wearing or scoring the drive shaft and seal. Two drains shall be supplied, one for draining the other for cleaning. In addition, a manually operated flushing connection shall be supplied in the drain area to breakup and clean accumulated debris.

2-12 WEAR LINER (ANTI-WEAR UHMW)

A. The wear liner for each conveyor shall be fabricated of ultra high molecular weight polyethylene sintered with an anti-wear filler to reduce wear and synthetic lubricant to reduce friction. The wear liner shall be furnished in maximum four foot sections to provide ease of replacement. The liner shall be held in place with clips; no fasteners will be allowed.

2-13 CONVEYOR SUPPORTS

- A. Each conveyor shall be furnished complete with supports suitable for mounting as shown on the contract drawings and as required by the supplier's design. The supports shall be shop fabricated from structural steel shapes and plates, and shall be assembled and fitted to the conveyor prior to its delivery to the jobsite. Supports and conveyor segments shall be match marked and shipped to the jobsite for assembly by the contraction others. At a minimum, each conveyor shall be provided with supports at the inlet and discharge end, with intermediate supports as required.
- B. Supports shall be fabricated of AISI 304 stainless steel or equal.
- C. All shop welding shall conform to the latest standards of the American Welding Society (AWS). The supports shall be designed to avoid interference with other equipment or equipment supports.

2-14 STRUCTURAL DESIGN

A. All structural supporting members shall be designed such that the ratio of the unbraced length to least radius of gyration (slenderness ratio) shall not exceed 120 for any compression member and shall not exceed 240 for any tension member (of angles about Z-Z axis). In addition, all structural members and connections shall be designed so that the unit stresses will not exceed the American Institute of Steel Construction allowable stresses by more than 1/3 when subject to loading of twice the maximum design operating torque of the spiral conveyor drive motors.

2-15 DRIVE UNITS

A. Each spiral conveyor shall be driven by a constant-speed integral gear reducer/motor drive unit mounted to an adapter flange mounted to the end plate of the conveyor. The adapter flange shall allow the leakage of any material from the conveyor trough to atmosphere rather than into the gear reducer/ motor drive unit. Direct coupling of the gear reducer/motor drive unit to the end flange of the conveyor will not be acceptable.

The drive unit shall be rigidly supported so there is no visible "wobble" movement under any operating condition. In the event of a prolonged power failure or emergency system shutdown the drive system shall be designed, at a minimum, to start the conveyor from a dead stop with the trough filled throughout its entire cross sectional area and length with partially dried and hardened dewatered material.

Each motor shall be 460 volt, 60 Hz, 3 phase conforming to the General Equipment specifications, except as modified herein. Each motor shall be high efficiency, 40C ambient rated, 1.15 service factor and shall have Class F insulation. Motor shall have a TEFC enclosure with Design B speed/torque characteristics.

2-16 GEAR REDUCERS

A. All gears shall be AGMA Class II, single or double reduction, helical gear units with high capacity roller bearings. Bearings shall be designed for the thrust loads from the fully loaded startup condition and shall have a AFBMA B10 life of 30,000 hours. The reducer will be the standard air cooled unit with no auxiliary cooling. The gear reducer shall be sized with a torque service factor of 1.5 times the absorbed power or 1.1 times the motor nameplate, at the driven shaft speed, whichever is greater.

2-17 MOTION FAILURE ALARM UNIT

A. Each conveyor drive unit shall be equipped with a motion failure alarm unit. The location and mounting details shall be as recommended by the conveyor manufacturer. Motion sensors shall be the non-contacting type using a probe with a pre-amplifier and main electronic assembly. The main electronic unit shall operate on 120 volt, single phase, 60 Hz power supply, and shall be housed in a NEMA 4X enclosure. An 0 to 60 second time delay shall be provided for startup of the conveyor.

2-18 EMERGENCY SHUTDOWN

A. Each conveyor shall be furnished with an emergency trip cord and safety switch. The cord shall run the full length of each conveyor. The trip switch shall immediately stop all conveyors when the switch is actuated.

2-19 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures.

PART 3 - EXECUTION

3-01 MANUFACTURER'S FIELD SERVICES

- A. After the equipment is installed the supplier shall provide a factory trained, experienced, competent, and authorized representative of the supplier to the jobsite to inspect, check, and approve the equipment installation supervise initial operation, and to train operating personnel in the proper operation and maintenance of the system. These services shall be performed by the supplier's representative at the jobsite when the equipment is placed in service.
- B. The supplier's representative shall furnish to the Contracting Officer, a written report certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchorage, and has been operated under full load conditions and that it operates satisfactorily.

DIVISION 15 - MECHANICAL

SECTION 15398

VERTICAL PROGRESSING CAVITY PUMPS

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SECTION 15398

VERTICAL PROGRESSING CAVITY PUMPS

PART 1 GENERAL

1-01 DESCRIPTION

- A. SCOPE: This section specifies vertical positive displacement progressing cavity pumps, complete with electric motors, and all specified appurtenances, as shown on the plans and specified herein.
- B. TYPE: The pumping units shall be of the vertical positive displacement, progressing cavity type specifically designed for pumping bulk liquid or polymer solutions, as specified and/or waste water sludges.

C. PERFORMANCE AND DESIGN REQUIREMENTS:

1. Sludge handling pumps shall be specifically designed and selected for continuous duty pumping of wastewater sludges with the following properties:

Percent Solids	Up to 6%
Specific Gravity	1.05
Apparent Viscosity	600 cPs
Solids Size	2"
pH	Neutral
Temperature	20-30C

- 2. The pumps shall be of the compact, close-coupled design. The gear reducer shall be sized for a minimum service factor of 1.5 and designed with a thrust load capability of 150 percent of the actual thrust load.
- 3. The pumps, along with associated drive appurtenances, shall be mounted on common fabricated steel mounting plate. The mounting plate shall be bolted to the tank top or chamber.
- 4. The pump discharge shall be below the pump mounting plate as shown on the plans.
- 5. The pump casing shall be equipped with an intermediate housing between the stator and discharge tube which facilitates the rapid exchange of the rotor, stator or U-joint.
- 6. The pumps shall be fitted with distance pins and a guide unit which anchors the bottom of the pump to the tank bottom.

E. OPERATING CONDITIONS: The vertical progressing cavity pumps shall have the following operating characteristics:

Equipment Service	Rated Capacity, gpm.	Maximum total Diff. pressure	Maximum/ minimum pump speed, rpm	Discharge port size, in	Minimum motor hp	Drive
Sludge Feed						
High Flow	200	30	211	5	15	Fixed
Low Flow	50	30	60		15	Reduction VFD

1-02 REFERENCES

A. This section contains references to the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of the section and those of the listed documents, the requirements of this section shall prevail.

]	Reference	<u>Title</u>
1	AGMA 6010-E-88	Spur, Helical, Herringbone, and Bevel Enclosed Drive
1	AGMA 6019-E-89	Gear Motors Using Spur, Helical, Herringbone, Straight Bevel, or Spiral Bevel Gears
1	AGMA 6023-A88	Design Manual for Enclosed Epicyclic Gear Drives

1-03 SUBMITTALS

- A. The following information shall be provided:
 - 1. Manufacturer's data including materials of construction and equipment weight.
 - 2. Predicted performance curves developed for the specific application. Performance curves shall plot speed, capacity, head, horsepower and efficiency required for the specified operating range.
 - 3. Motor data as specified in this Specification.
 - 4. A copy of the contract document control diagrams and process and instrumentation diagrams, with addenda updates, that apply to the equipment in this section marked to show specific changes necessary for the supplied equipment. If no changes are required, the drawing shall be marked "no changes required."

5. A copy of this specification section with addenda updates, and all referenced sections with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.

PART 2 PRODUCTS

2-01 ACCEPTABLE PRODUCTS

A. Progressing cavity pumps shall be Seepex Series BE, Model #BEU 70-6L / B2-B2-A7-F9-GAM or approved equal.

2-02 MATERIALS

Component	Material - Sludge Pumps	
Rotor	AISI 316 Ti with Duktil* coating	
Stator	HNBR	
Pump Body	Steel	
Mechanical seals	Burgmann MG1- Dw/G60Q1Q1VGG	

^{*} Chromium nitride coating using the Duktil coating technique.

2-03 EQUIPMENT

- A. ROTOR AND STATOR: Each pump shall be a one stage design employing a convoluted rotor operating in a similarly convoluted stator. The convolutions shall be configured to form a cavity between the rotor and stator which shall progress from the pump's inlet to discharge port with the operation of the rotor. The fit between the rotor and stator at the point of contact shall compress the stator material sufficiently to form a seal and to prevent leakage from the discharge back to the inlet end of the pumping The stator shall be molded with a seal integral to the stator elastomer preventing the metal stator tube and the bonding agent from the elastomer from contacting the pumped liquid. Gaskets or "O" rings may not be used to form this seal. Stators for sludge pumps shall have HNBR elastomer. The sludge pump rotors shall be Additionally the sludge pump rotors shall have a constructed of AISI 316 Ti. chromium nitride coating (Duktil) with a hardness of 1350 Vickers and a minimum thickness of 200 μ m (.008"). Hard chrome plating or ceramic coatings are not acceptable due to the ease at which this coating will crack and the lack of diffusion into the rotor base metal.
- A. ROTOR AND DRIVE TRAIN: The rotor drive train shall be warranted for one (1) year from acceptance and shall consist of the following:
 - 1. Each pump rotor shall be driven through a positively sealed and lubricated pin joint. The pin joint shall have replaceable bushings, constructed of air-hardened

tool steel of 57-60 HRc, in the rotor head and coupling rod. The pin shall be constructed of high speed steel, air hardened to 60-65 HRc. The joint shall be grease lubricated with a high temperature (450? F), PTFE filled synthetic grease, covered with Buna N sleeve and positively sealed with hose clamps constructed of 304 stainless steel. A 316 stainless steel shell shall cover the rotor sided universal joint assembly to protect the elastomer sleeve from being damaged by tramp metals or glass. The universal joints shall carry a separate warranty of 10,000 operating hours. This warranty shall be unconditional in regards to damage or wear.

- C. CASING: A 150-pound (ANSI B16.5) raised face flanged connection shall be provided at the discharge port in the size shown in the plans.
- D. SHAFT SEALS AND BEARINGS: Each pump shall be provided with oil lubricated thrust and radial bearings located in the gearmotor, designed for all loads imposed by the specified service. Shaft shall be sealed using a single-acting mechanical seal as specified in 2.02. The shaft shall be solid through the mechanical seal area, but of a two part design which allows the mechanical seal and all other wetted tool rotating parts to be removed from the pump without disassembly of the pump or gear motor bearings. Mechanical seals shall be with solid silicon carbon faces with 316 stainless steel metal parts and viton elastomers. Pump manufacturer shall supply with each pump a seal water quench system comprised of a pot and all required fittings needed for a complete system.

E. MOTOR AND DRIVE UNIT:

- 1. Gear motors or gear reducers shall be designed in accordance with AGMA 6019-E (Class II). Unless otherwise noted, motors shall be energy-efficient, Type 2 motors suitable for the service indicated.
- 2. The pump supplier shall be responsible for the provision of the fixed reduction between the motor and pump. The reduction ratio shall be that required to operate the pump at its maximum operating speed when the motor is operating at its nominal rated full speed in accordance with these Specifications. ASD-driven units may be operated at 105 Hz at the maximum speed.

2-04 PRODUCT DATA

- A. The following information shall be provided in Submittal:
 - 1. Mill certifications confirming hardness of rotor and stator.
 - 2. Applicable operation and maintenance information specified in these Specifications.
 - 3. Motor data as specified in this Specification.
 - 4. Installation certification Form.
 - 5. Training certification.

2-05 STANDBY COMPONENTS

- A. One set of packing tools shall be provided to service the pumps. In addition, the following shall be provided for each pump size (as appropriate for type of drive provided):
 - 1 stator assembly
 - 1 rotor
 - 1 set connecting rod joint assemblies
 - 1 mechanical seal
- B. Standby components shall be tagged and stored in accordance with provisions of these Specifications.

PART 3 EXECUTION

3-01 INSTALLATION

A. The pumps shall be installed as specified and in accordance with manufacturer's written recommendations. The installation and initial operation of all components shall be certified by a field representative of the Manufacturer.

3-02 TESTING

A. After completion of installation, the pumps shall be completely tested to demonstrate compliance with operating requirements as specified.

DIVISION 15 - MECHANICAL

SECTION 15400

PLUMBING

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SECTION 15400

PLUMBING

PART 1 - GENERAL

1-01 RELATED REQUIREMENTS AND SECTIONS

- A. Examine all other divisions of the specifications and all drawings for the project and be familiar with all features of the project which may affect plumbing work.
- B. Section 15800 Heating, Ventilating and Air Conditioning.

1-02 SCOPE OF WORK

- A. Include the furnishing of all labor, materials, equipment, tools, instruments, etc., required to furnish and install a complete plumbing system in accordance with these specifications together with the accompanying drawings and shall in general include but is not necessarily limited to the following:
 - 1. Sanitary Drainage System
 - 2. Vent Piping
 - 3. Domestic Water Piping
 - 4. Plumbing Fixtures
 - 5. Floor Drains
 - 6. Cleanouts
 - 7. Insulation
 - 8. Compressed Air System
 - 9. Non-Potable water piping. (System from reduced pressure backflow preventing serving water hose reels and hose bibbs).
- B. Everything necessary for a complete and satisfactory installation, including all necessary parts, devices, accessories, etc., required by the Codes or that may be required to satisfactorily complete the installation.

1-03 WORK BY OTHERS

- A. Division 16 of these specifications will provide all electrical power outlets as required to connect electrically operated equipment furnished by Section 15400, Plumbing.
- B. Where, due to union regulations or trade agreements, any of the work shown on the drawings or specified herein is not considered Plumber's work, subcontract the work in question, but assume full responsibility for the complete installation.

1-04 EXPLANATION AND PRECEDENCE OF DRAWINGS

A. For purposes of clearness and legibility, plumbing drawings are essentially diagrammatic and, although size and location of equipment are drawn to scale wherever possible, make use of all data in all of the contract documents and verify this information at building site.

- B. The drawings indicate required size and points of termination of pipes and suggest proper routes of pipe to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this section to install piping in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instruction or cost.
- C. Shop drawings shall be furnished by this section, indicating all changes to meet space requirements, code requirements, and as necessary to resolve all space conflicts.
- D. It is intended that all apparatus to be located symmetrical with Contracting Officerural elements, and shall be installed at exact height and locations as shown on the Contracting Officerural drawings.
- E. Be fully informed regarding any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the contract. Exercise due and particular caution to determine that all parts of plumbing work are made quickly and easily accessible. Although the locations of the equipment and piping may be shown on the drawings in certain positions, refer to the Contracting Officerural details and conditions existing at the job, correlating this work with that of the other trades, and report to the Contracting Officer any discrepancies or interferences that are discovered. Failure to report such discrepancies and interferences shall result in the correcting of these errors or omissions at no extra cost to the owner. No work shall be installed under this division which deviates from the drawings and specifications, without prior approval of the Contracting Officer.
- F. Be responsible for taking measurements and installing plumbing work to suit conditions encountered.

1-05 CODES, PERMITS AND ORDINANCES

A. All work shall be executed and inspected in accordance with all local or state codes, laws, ordinances, rules and regulations applicable to the particular class of work. Include in quotation all applicable service charges, fees, permits, royalties, and other similar costs. If the drawings or specifications are at variance with the above mentioned laws, rules and regulations, promptly notify the Contracting Officer in writing so any necessary changes can be provided for in his contract. Do not perform any work knowing it to be contrary to such laws, rules or regulations, and without notice as required above.

1-06 SHOP DRAWINGS AND EQUIPMENT SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Data shall be organized and listed as follows:
 - 1. Cleanouts and Covers
 - Valves
 - 3. Pipe Hangers and Supports
 - 4. Pipe Insulation
 - 5. Piping
 - 6. Plumbing Fixtures and Trim
 - 7. Water Heaters
 - 8. Hose reels
 - 9. Air Compressor and Dryer

1-07 PROTECTION OF WORK

A. Protect work at all times from danger by freezing, breakage, dirt, foreign materials, etc., and shall replace all work so damaged. Use every precaution to protect the work of others. Be responsible for all damage to other work caused by plumbing work or through the neglect of plumbing workmen.

PART 2 - PRODUCTS

2-01 GENERAL

A. Materials and/or equipment involved in the specified installation shall be of the test for the purpose intended. The Contracting Officer reserves the right to reject any materials and workmanship not in accordance with these specifications.

2-02 PIPES AND FITTINGS

- A. All pipes specified herein shall be uniform in size, sound and free from defects smooth on the inside and of sufficient strength to suit the particular system.
 - 1. All copper pipe above grade shall be hard-drawn Type "L" copper water tubing (ASTM B-88) for sil-fos joints; and Type "K" soft drawn for underground piping. Fittings shall be wrought copper conforming to ASA B16.22 or cast bronze conforming to ASA B16.18.
 - 2. Sanitary piping above floor shall be:
 - **a.** Schedule 40 PVC-DWV pipe and fittings with solvent weld joints in accordance with ASTM D2665-78 where allowed by local codes.
 - 3. Sanitary piping below grade withing 5 feet of building shall be:
 - **a.** Schedule 40 PVC-DWV pipe and fittings with solvent weld joints in accordance with ASTM D2665-78 where allowed by local codes.
 - 4. Compressed air piping shall be:
 - a. Schedule 40 black steel pipe with minimum 300 psi malleable steel fittings

2-03 PIPE JOINTS

- A. Joints in plastic pipe shall be made with PVC solvent cement ASTM D-2564-79 installed in strict compliance with manufacturer's recommendations.
- B. Couplings or adapters for joining dissimilar piping materials shall be provided of types recommended by manufacturers.

2-04 PIPE HANGERS AND SUPPORTS

A. All piping shall be installed with provision for expansion without strain on piping system or connected equipment. Provide swing or swivel joints on connection from

mains to branches where necessary to provide for expansion. All pipe hangers and supports shall conform to the latest requirements of Manufacturer's Standardization Society Documents MSS-SP-58 and MSS-SP-69.

B. In general, piping hangers shall be spaced as follows:

		Std. Wt. Steel Pipe		Copper	Tubing
Nom. Pipe or Tube Size	Rod Size	Water Service max. ft.	Vapor Service max. ft.	Water Service max. ft.	Vapor Service max. ft.
1/2 "	3/8"	7	8	5	6
3/4"	3/8"	7	9	5	7
1"	3/8"	7	9	6	8
1-1/4"	3/8"	7	9	6	8
1-1/2"	3/8"	9	10	6	8
2"	3/8"	10	10	10	10
2-1/2" & 3"	1/2 "	10	10	10	10
4" & 5"	5/8"	10	10	10	10
6"	3/4"	10	10	10	10
8" & 10"	7/8"	10	10	10	10

Cast iron drainage, waste and vent pipe shall be supported every 5 feet for 5-foot length pipes and every 10 feet for 10-foot length pipes. Hangers shall be located as near joint as possible with 24-inch maximum distance from joint.

- C. The spacing above is based on straight runs only. Provide extra supports at all turns, offsets, etc., or where additional weight or load is imposed on a line such as valves, fittings, and branch connections.
- D. All hangers for piping must be of a design which will permit removal and replacement of band and hanger without taking down the pipe and must also permit vertical adjustment of pipes.
- E. Horizontal runs of copper tubing shall be supported as per Manufacturers Standardization Society Documents MSS-SP-58 and MSS-SP-69.

- F. All other horizontal lines, except copper, shall be supported by means of adjustable split swivel ring hangers as per Manufacturers Standardization Society Documents MSS-SP-58 and MSS-SP-69.
- G. Vertical runs of pipe not over 12 feet long shall be supported by hangers placed not over one foot from the elbows connecting horizontal runs.
- H. Hangers or supports for piping 4" size and smaller on walls, columns or floors, shall be as per Manufacturers Standardization Society Documents MSS-SP-58 and MSS-SP-69, for all other lines complying.
- I. All horizontal piping shall be suspended from the building structure by mild steel rods connecting the pipe hanger to either a concrete insert nut or beam clamp, as the case may be.
- J. Where piping is to be supported from the building structural steel, beam clamps, Manufacturers Standardization Society Documents MSS-SP-58 and MSS-SP-69 shall be used. Beam clamp selection shall be on the basis of the required load to be supported. Where welded beam attachments are required, permission shall be obtained from the Contracting Officer before welding, and welding attachments shall be as per Manufacturers Standardization Society Documents MSS-SP-58 and MSS-SP-69. Holes drilled in building steel for hanger support rods will not be permitted.
- K. Where inserts are not in suitable locations for proper installation of pipes, provide approved suitable channels, or angles, from which to suspend hangers.
- L. Hanger rods shall not pierce ducts.
- M. Furnish all additional steel supports necessary for the installation of the pipe hangers. Supports shall be designed in accordance with AISC Steel Handbook with a safety factor of 5 built in.

2-05 SLEEVES AND ESCUTCHEONS

- A. Sleeves through structural concrete members and sleeves for walls below grade and floors on grade shall be standard weight galvanized Schedule 40 steel pipe. Sleeves through other than structural components of the building shall be 20 gauge galvanized sheet metal with lock seam joints. Top of sleeve shall be 2" above floor minimum. Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534, shall be installed between sleeve and pipe.
- B. Escutcheon plates to be installed where exposed piping passes through walls, ceilings, and floors of building, shall be minimum 20 gauge steel, chromium plated. Exposed hanger rods in finished spaces with ceiling shall have escutcheon. All escutcheons shall have set screws. Split type escutcheon plates are not acceptable.

2-06 VALVES

- A. Valves shall be of single manufacture insofar as applicable. Valves shall be similar to the following:
 - 1. Gate Valves AWWA C 500-93
 - 2. Ball Valves AWWA C 500-93

2-07 CLEANOUTS

- A. Cleanouts shall be provided in waste and drainage lines where indicated on drawings and/or as required by plumbing code. Cleanouts shall be sized same as for pipe in which installed, except no cleanout need be larger than 4" diameter.
- B. Where installed in exposed cast iron pipe, cleanouts shall consist of raised-head cast brass plug with caulking ferrule equal to Wade W-8550-A. Where installed in tapped drainage fittings, cleanouts shall be cast brass raised-head plug equal to Wade W-8690-A.
- C. Where installed in floors, cleanouts shall consist of cast iron ferrule, brass plug, adjustable cast iron housing and nickel brass scoriated cover and matching flange for flush mounting equal to Wade W-7000. Cleanouts in tile floors shall have recessed cover equal to Wade W-7000-T.
- D. Clean out installed in grass or dirt areas shall be set in a 12" x 12" x 6" thick concrete pad.

2-08 INSULATION

- A. Domestic water lines, storm drain and piping carrying HVAC condensate, above grade, shall be insulated with (½" for cold water, storm drain & piping carrying HVAC condensate, and 1" for hot water and hot water return) molded low pressure fibrous-glass insulation with manufacturer's standard white vapor barrier glass cloth jacket. Fittings shall be insulated with same material as pipe.
- B. Insulation shall be a product of a single manufacturer as per ASTM C 547.

2-09 FLOOR DRAINS

A. General: Provide area drains of size and type indicated on drawings including features as specified herein.

2-10 REDUCED PRESSURE BACKFLOW PREVENTERS:

A. Size 3/4" - 2": The device shall consist of a pressure differential relief valve located in a zone between two positive seating check valves. Back-siphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel, or directly into the supply pipe via a separate vent. the reduced pressure zone backflow preventer shall have all access port covers secured with stainless steel cap screws which are bolted to valve body. Check valve shall be of modular design so as not to include spring loaded covers. It shall have a choice of union (U), flanged adapter (FE) or NPT body connections, removable seats and individually factory tested and rated at 175 PSI. The assembly shall include two full port resilient seated bronzed ball valve shut-offs, four ball-type cocks, three of which are located on top of the device, and a protective strainer with 20 mesh stainless steel screen upstream of the No. 1 shut-off valve. The device shall meet the requirements of A.S.S.E. Std. 1013; AWWA Std. C506, CSA B64.4; FCCCHR of USC Manual Section 10. Listed by IAPMO (UPC); SBCCI (Standard Plumbing Code) (3/4" to 2" size).

2-11 COMPRESSED AIR SYSTEM

A. The device shall include a two-stage air compressor and a three-in-one refrigerated dryer.

Cast iron two-stage pumps width low RPM. 208/1/60, working pressure 175 psi. receiver shall be a horizontal type with 80 gal capacity with safety valve pressure gauge, and manual tank drain. Pressure switch unloading set for 145 PSI on, 175 PSI off. System shall be hard wired with disconnect.

2-12 PLUMBING FIXTURES

- A. Plumbing fixtures and trim shall be furnished as indicated on the Contracting Officerural and plumbing drawings with all hot and cold water supplies, waste and vent connections, fittings, supports, trim and accessories. All fixtures shall be covered during construction of the building as a protection against dirt or injury. Plumbing Contractor shall cooperate with the General Contractor in setting of supports for fixtures.
- B. All enameled cast iron fixtures shall be acid resisting enamel.
- C. All exposed metal work on or around fixtures, unless otherwise specified, shall be best quality chromium plated brass.
- D. All wall mounted fixtures shall be supported with floor mounted fixture carrier.

2-13 PLUMBING FIXTURE SCHEDULE

A. Refer to Drawing AP1.02 & AP2.02.

2-14 FLOOR DRAIN

A. Refer to drawing AP1.02 & AP2.02.

PART 3 - EXECUTION

3-01 WORKMANSHIP

- A. All work is to be installed by competent workmen in their respective fields. The installation is at all times to be under supervision of a supervisor who is thoroughly familiar with all portions of the installation.
- B. All work is to be accomplished in a finished and workmanlike manner in accordance with acceptable best standards of the trade.
- C. All work shall be performed in accordance with all State and Local Codes.

3-02 PAINTING

- A. The following protective painting and identification of equipment shall be provided under this division of the work. Other finish painting shall be provided under Section 09900 of the specifications.
- B. Uncoated black ferrous piping and fittings except where concealed by furring or chases shall be cleaned and painted with one coat of black enamel heat resistant paint. Exposed cast iron piping shall be provided with one coat of asphalt base aluminum paint. Hangers and supports shall be coated by dipping or brush painting with one coat of asphalt varnish.

1. Underground piping and fittings of various ferrous materials shall be provided with heavy coating of asphaltum or coal tar pitch. Underground water piping shall be provided with heavy coating of protective bituminous compound.

3-03 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. Markings: Each piping and conduit system installed shall be identified wherever accessible for maintenance operations, and the direction of flow (where applicable) shall be indicated by legends and flow arrows. The markings shall be applied after all painting and cleaning of the piping and insulation is completed. Identify with semi-rigid plastic marked bands with background color coded. Marker materials shall completely encircle the pipe when smaller than 8 inch IPS.
 - 1. Provide ½ inch letters, 8 inch long color field on outside diameters less than 1-1/2 inch.
 - 2. Provide 3/4 inch letters, 8 inch long color field on outside diameters of 1-1/2 to 2 inch.
 - 3. Provide 1-1/4 inch letters, 12 inch long color field on outside diameters over 2 inch, but smaller than 8 inch.

Classification	Color of Field	Colors of Letters for Legend
Domestic Cold Water	Green	Black
Domestic Hot Water	Yellow	Black

- B. Apply identification to piping throughout, except piping located underground between manholes, in furred spaces without means of access, or buried in the ground or encased in concrete.
- C. The legend and flow arrow shall be applied at each valve location, at each point where piping enters or leaves a wall, partition, bulkhead, cluster of piping, or similar obstruction, and at approximately 30-foot intervals on pipe runs with at least one legend and flow arrow in each space or room; color of legend and flow arrow shall be as noted.
- D. Variations or changes in locations and spacing shall be made to meet conditions.
- E. Wherever two or more pipes run parallel, the printed legend and other markings shall be applied in the same relative location so as to be in either vertical or horizontal linearity, whichever the case may be.
- F. The markings shall be located so as to be conspicuous and legible from any reasonable point.

3-04 PIPES AND FITTINGS

- A. Determine, in advance of construction, locations of all piping, sleeves, hangers, flow lines, elevations, etc. Pipe shall be erected neatly and workmanlike, parallel with building lines.
- B. Domestic water piping: Joints shall be sil-fos. Joints shall be cleaned and non-corrosive flux applied before soldering.

- C. Water piping shall not be installed in areas subject to freezing without adequate insulation and heat cable as required.
- D. All threaded piping shall have pipe joint compound applied to male threads only. Threads shall be cleaned free of dirt and burrs before joining. Two pipe threads shall be exposed after joining pipe.
- E. Isolate connections of copper and steel pipe and isolate piping above slab from piping below slab with cathodic isolating unions.
- F. All piping shall have provision for expansion and contraction with anchorage at each point shown on the plans and/or required.

3-05 PIPE HANGERS AND SUPPORTS

- A. Provide proper support of all equipment and piping furnished and/or installed, except as specifically stated to be furnished by others.
- B. All piping shall be substantially supported in a neat and workmanlike manner and shall be free from sagging, with loops, etc., as required for expansion and contraction.
- C. For multiple pipe runs, trapeze hangers shall be fabricated from structural steel, i.e., steel channel or angle of sufficient strength. Where trapeze hangers are used, a U-bolt shall be installed to anchor pipes at each hanger.
- D. Hanger locations shall not exceed a distance of 2'-6" from point of change in piping direction. All pipe 4" and larger suspended from structural steel shall have a hanger at each joist. Cast iron pipe shall have a hanger for each pipe length. All pipe lengths over ten feet shall have a hanger at ten-foot intervals.
- E. Clamps, inserts, bolts, racks, etc., shall be furnished for piping supports where required and shall have strength equal to that of rod scheduled.
- F. Vertical piping shall be supported with riser clamps or other satisfactory means as dictated by the particular situation and as recommended by the hanger manufacturer. Special situations shall be taken care of as dictated by good practice. Base of each stack shall be supported with concrete base support.
- G. Equipment shall be supported adequately with all bracketing, foundations, angles, channels, hangers, etc.
- H. All bolts connecting channel clamping nuts to channel shall be torqued to 50 ft.lbs.
- I. Do not use branch lines to brace main lines.

3-06 SLEEVES AND ESCUTCHEONS

- A. Sleeves shall be installed where piping passing through building construction occurs. Sleeves shall be sized for insulation to pass through. Sleeves shall be of ample size for pipe movement (unless a fire or smoke seal is required) and shall not be used as means of pipe support.
- B. Sleeves for piping penetrating floors shall project above the floor two inches (unless a fire or smoke seal is required).

C. Escutcheon plates shall be properly sized to conceal sleeves and fastened to pipe or insulation with set screw. Exposed hanger rods in finished spaces shall have cast iron escutcheons with set screw.

3-07 UNIONS

A. When not integral with equipment or valves, unions shall be installed adjacent to same for their easy removal. Unions are not required at solder connected water service valves. Unions shall be installed on equipment side of shut-off valves and fixture traps. Dielectric unions shall be installed where dissimilar metals are joined.

3-08 VALVES

- A. Valves shall be installed at each piece of equipment and at branches off mains and as indicated.
- B. Check valves and special purpose valves necessary for proper system functioning shall be installed where required.
- C. Valves shall be accessibly located and same size as piping in which they are installed (unless noted otherwise).

3-09 FLASHING

- A. Vent pipes extending through roof shall be flashed with cone type flashing with clamp and non-hardening caulking at top. Install in accordance with roof manufacturer's recommendations.
- B. Vent pipes extending through roof shall be flashed with 4 pound sheet lead turned up around vent pipes, turned in at top and beaten smooth on the inside so as not to obstruct the pipe area. Lead shall extend at least 18-inches onto roof from vent pipe.
- C. Floor drains shall be flashed with 4 pound sheet lead or CPE waterproof membrane 40 MIL thick as equal to Chloraloy; extended 18-inches from centerline of drain.

3-10 CLEANOUTS

- A. Cleanouts shall be installed where shown on drawings and at all points where required for adequate service of drainage systems. Cleanouts shall be installed per code, at base of all stacks, and at all changes in direction of 45 degrees or more.
- B. Install cleanouts with covers where pipe is concealed in walls and floors.
- C. Where cleanouts are on accessible pipe, cleanout plugs shall be raised head type.
- D. All cleanout caps to be wiped with "Key Grease" for easy removal.

3-11 INSULATION

- A. Domestic cold water and hot water lines, above grade, horizontal storm drain piping above ceilings and in exposed areas, and any piping carrying HVAC condensate shall be insulated.
- B. Insulation shall be applied over clean, dry surfaces after piping has been tested and proven tight. Fittings, valve bodies, etc., shall be insulated with factory molded covering or molded by hand with suitable insulating material and binder same thickness as adjoining

pipe covering. Omit insulation at unions and flanges, and at these points bevel insulation neatly and finish as specified for fittings. All insulation shall be installed in strict accordance with manufacturer's recommendations.

C. Insulation on all piping shall be continuous through hangers and sleeves.

3-12 CROSS CONNECTIONS

- A. Piping shall not be installed in a manner to permit back-siphonage or any flow of polluted water or other liquid into domestic water piping system under any condition.
- B. Air gaps, receptor type drains and approved vacuum breaking devices shall be provided as required by local codes and ordinances. Piping to hose-end faucets or to inlet below fixture overflow shall have vacuum breakers of make, design, size and location approved by the inspector of plumbing. Vacuum breakers shall not be concealed, shall be full size of pipe, and shall be chrome plated.

3-13 PROTECTION OF WORK

A. Protect work at all times from danger by freezing, breakage, dirt, foreign materials, etc., and shall replace all work so damaged. Use every precaution to protect the work of others, and be held responsible for all damage to other work caused by his work or through the neglect of his workmen.

3-14 TESTING AND ADJUSTING

- A. Upon completion of work, all equipment shall be cleaned and adjusted for proper operation and any defects discovered shall be corrected before final inspection prior to acceptance.
- B. Soil, waste and vent piping shall be tested by plugging all openings and filling entire system with water to level of highest vent stack and/or required by local plumbing code. Test shall be maintained for not less than one hour.
- C. Water circuits shall be thoroughly cleaned, pressure tested and proven tight with minimum 100 lbs. hydrostatic pressure. Test or interior piping shall be made prior to setting of fixtures. Complete system sterilization shall be provided as required by code.

3-15 PLUMBING CONNECTIONS TO EQUIPMENT OF OTHER SECTIONS AND OWNER FURNISHED EQUIPMENT

A. General: Under other sections and/or other contracts, certain equipment will be furnished and set in place ready for plumbing connections as indicated.

3-16 DISINFECTION OF WATER SYSTEM

- A. After the water piping system has been completed, tested and approved, including all fixtures and equipment connections thereto, and before placing the system in operation for Owner's use, sterilize the entire water system as follows:
- B. Drain entire water system.
 - 1. Refill entire water system with sterilizing solution of water containing 50 parts per million of available chlorine.

- 2. Allow sterilizing solution to remain 24 hours, then drain out all traces of sterilizing solution.
- 3. Flush water system through all fixtures and outlets to remove all traces of sterilizing solution.
- 4. Negative bacteriological samples shall be obtained from water system before system is used.
- 5. After completion of work, furnish Designer with letter certifying that water system has been approved by the local health department.

3-17 WATER HAMMER ARRESTERS

A. Install with access panels or above lay-in ceilings.

DIVISION 15 - MECHANICAL

SECTION 15800

HEATERS, VENTILATING AND AIR CONDITIONING

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SECTION 15800

HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1-01 SUMMARY

A. Requirements of the Conditions of the Contract and Section 00800 of the Specifications apply to this Section.

1-02 WORK INCLUDED

- A. Includes the furnishing of all labor, materials, equipment, tools, instruments, etc., required for the installation of complete heating, ventilating and air conditioning systems.
- B. The work shall in general include, but is not necessarily limited to, the following:
 - 1. Unit Heaters
 - 2. Exhaust Fans
 - 3. Heat Pump Air Handling Unit (2.80)
 - 4. Condensate Drain Piping
 - 5. Ductwork
 - 6. Heat Pump Condensing Units (2.81)
 - 7. Insulation
 - 8. Temperature Controls
 - 9. Testing and Balancing
 - 10. Operating and Maintenance Manuals
- C. Everything necessary for a complete, safe and satisfactory installation, including all necessary parts, devices, accessories, etc., required by the codes, or that may be required, shall be furnished and installed by this Contractor. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance when complete.

1-03 EXPLANATION AND PRECEDENCE OF DRAWINGS

- A. For purposes of clearness and legibility, drawings are essentially diagrammatic, and, although size and location of equipment are drawn to scale where possible, the Contractor shall make use of all data in all of the contract documents and shall verify this information at building site.
- B. The drawings indicate required size and points of termination of pipes and ducts, and suggest proper routes of pipe to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this section to install piping and ducts in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear without further instruction or cost.
- C. Shop drawings shall be furnished by this section indicating all changes to meet space requirements, code requirements, and as necessary to resolve all space conflicts.
- D. It is intended that all apparatus be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings.

- E. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the space available for the installation of all work and materials furnished and installed under the Contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.
- F. The Contractor shall be guided by the architectural details and conditions existing at the job, correlating this work with that of the other trades, and report to the Contracting Officer any discrepancies or interferences that are discovered. Failure to report such discrepancies and interferences shall result in the correcting of these errors or omissions by the Contractor at his own expense. All work installed under this division which deviates from the drawings and specifications without prior approval of the Contracting Officer shall be altered by the Contractor at his own expense to comply with the drawings and specifications as directed by the Contracting Officer.

1-04 CODES AND STANDARDS

A. All work shall be executed and inspected in accordance with all local or state codes, laws, ordinances, rules and regulations applicable to the particular class of work. The Contractor shall include in his quotation all applicable service charges, fees, permits, royalties, and other similar costs in connection therewith. If, to the knowledge of the Contractor, the drawings or specifications are at variance with the above mentioned laws, rules and regulations, he shall promptly notify the Contracting Officer in writing so any necessary changes can be provided for in his contract. If the Contractor performs any work without notice as required above, he shall bear all costs arising therefrom.

1-05 INSPECTION OF SITE

A. Prior to submitting his bid, the Contractor shall visit the site of the proposed construction and shall thoroughly acquaint himself with existing utilities, working conditions to be encountered, etc. No additional compensation shall be allowed for conditions increasing the Contractor's cost which were not known or appreciated by him when submitting his proposal if the condition was obvious and could have been discovered by him if he had visited the project and thoroughly informed himself of all existing conditions which would affect his work.

1-06 AS-BUILT PLANS

A. This Contractor shall make drawings depicting any variances from the contract documents. These drawings shall be made on sheets the same size as the working drawings, in pencil on tracing paper, legibly drawn and lettered. These tracings shall be delivered to the Contracting Officer to be incorporated with the permanent file of drawings of this building.

1-07 SUBMITTALS AND SHOP DRAWINGS

- A. Submit shop drawings, wiring diagrams and manufacturer brochures of equipment to the Contracting Officer prior to ordering equipment or beginning work.
- B. Six complete and bound submittals, indexed as indicated below, shall be submitted. Partial submittals will be returned without review. The Contractor shall by his signature indicate his review of the submittal.
- C. Shop drawings and submittal data shall be submitted on the following items:
 - 1. Heat Pump Condensing Unit
 - 2. Flexible Duct

- 3. Unit Heaters
- 4. Temperature Controls
- 5. Heat Pump Air Handling Unit
- 6. Insulation
- 7. Diffusers, Grilles, Registers and Louvers
- 8. Hangers and Supports
- 9. Test/Balance Agent
- 10. Fans
- 11. Roof Curbs

1-08 GUARANTEE

- A. Latent defects arising during the period of one year from final date of acceptance of all work by the Contracting Officer shall, upon notification by the Contracting Officer, be promptly corrected by the Contractor at no additional cost, regardless of date of shipment of equipment. Loss of refrigerant or lubricant shall be considered as a defect in workmanship.
- B. The warranty does not cover service or maintenance required as normal procedure during the one year period.
- C. All compressorized units and chillers shall have 5-year parts-only compressor warranty.

1-09 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Before acceptance of his work by the Contracting Officer, the Contractor shall furnish three complete clean bound copies of all supplementary shop drawings, diagrams, parts lists, serial numbers and inventory of equipment, manufacturer's operating and maintenance instructions, and all other similar material pertinent to the satisfactory maintenance and operation of mechanical systems and equipment furnished under this division of the work. After completion of his work and after satisfactory tests and adjustments of systems and equipment, the Contractor shall provide the services of a competent mechanic for the period of four days for the purpose of instructing the Owner's authorized representative in the maintenance and operation of the mechanical facilities.

1-10 STORAGE OF MATERIAL

- A. Make provisions for the delivery and safe storage of all materials, and arrange with other trades on the job for the introduction into the building of equipment too large to pass through finished openings.
- B. Arrange to have materials delivered to the job at such stages of the work as will expedite the work as a whole. Mark and store all materials in such a manner as to be easily checked or inspected.

1-11 PROTECTION OF WORK

A. This Contractor shall protect his work at all times from danger by freezing, breakage, dirt, foreign materials, etc., and shall replace all work so damaged. The Contractor shall use every precaution to protect the work of others, and he will be held responsible for all damage to other work caused by his work or through the neglect of his workmen.

1-12 SAFETY DEVICES

A. Contractor shall furnish and install safety guards for all dangerous moving parts such as belts and pulleys, flexible shaft connections and the like, and shall provide all required safety controls to prevent dangerous or damaging operation of equipment.

PART 2 - PRODUCTS

2-01 GENERAL

- A. The Contracting Officer reserves the right to reject any materials and workmanship not in accordance with the specifications.
- B. Apparatus and materials used in this work which are subject to testing by Underwriters Laboratories shall bear the UL label.

2-02 MECHANICAL IDENTIFICATION

A. Nameplates shall be laminated three-layer plastic with engraved black letters on light contrasting background color.

2-03 PIPING MATERIALS

- A. Condensate Drain Piping: All condensate drain piping shall be installed using Type L copper pipe with drainage fittings.
- B. Refrigerant piping shall be installed using Type "L" copper pipe with wrought fittings.
- B. Unions shall be provided at all equipment connections and elsewhere as indicated on the plans and as required for convenient disconnection equipment for inspection and repairs. Unions 2" and smaller shall be of malleable ground joint pattern with brass-to-iron seat.
- D. Provide dielectric fitting at joints of dissimilar pipe.

2-04 PIPE SLEEVES

- A. Pipes passing through masonry or concrete construction shall be fitted with sleeves. Sleeves through walls shall be cut flush with the wall surfaces. Sleeves through floors shall extend 2" above the finished floor.
- B. The inside diameter of pipe sleeves shall, in all cases, be at least 1" larger than the outside diameter of the passing pipe covering. Sleeves in floor slabs and load bearing walls shall be steel pipe. Sleeves in other masonry shall be constructed of galvanized sheet steel with lock seam joints; 24-gauge for 3" and smaller; and 22-gauge for 4" to 6" inclusive.

2-05 ESCUTCHEON PLATES

A. Chromium plated escutcheons shall be provided for all bare piping and for all insulated piping where piping passes through walls and/or ceilings in finished locations. Plates shall be chrome plated spun brass of plain pattern and set tight on the pipe and to the building surface. Split type escutcheon plates are acceptable.

B. Cast iron escutcheon plates shall be provided where pipes are exposed in unfinished locations of the building and run through walls, and/or ceilings. Cast iron escutcheons shall also be installed on hanger rods where required to cover openings in concrete at the hanger rod.

2-06 INSULATION (ABOVE GROUND)

- A. Condensate drain piping shall be insulated according to pipe size as follows: 4" pipe and below 1" insulation. Insulation shall be continuous through all hangers and sleeves and through all building surfaces.
- B. Factory premolded fittings matching basic insulation shall be provided at all pipe fittings and valves and covered with molded covers.
- C. All valves, strainers, fittings flanges, etc., are to be insulated with same type and thickness of adjacent insulation.
- D. Rectangular supply, return, and outside air ducts shall be internally insulated with 1/2" thick, 2 lb. density duct liner having heavy neoprene coating equal to Fiberglas Aeroflex applied in accordance with the manufacturer's recommendations for 2,000 fpm velocities. Material shall have UL fire spread and smoke developed rating, maximums of 25 and 50, respectively. Duct sizes shown on the drawings are sheet metal dimensions, allowance for liner have been included.
- E. Refrigerant suction pipe shall be insulated with 1" flexible unicellular insulation. Provide lacquer finish on exterior insulation.
- F. All insulation shall satisfy 25/50 fire/smoke developed rating.
- G. Ductwork exposed to outside shall be insulated with 2 inches fiberglas vapor seal duct insulation and weatherproofed with mastic troweled 1/4 inch thick over 1/2 inch mesh wire.
- H. Provide weatherproof aluminum cover over exterior refrigerant and condensate pipe.
- I. All supply and return ductwork located in the attic space shall be wrapped with 2" thick foil faced duct wrap.

2-07 SHEET METAL WORK (LOW PRESSURE)

- A. Ductwork shall be new, prime quality, zinc coated steel sheets. Sheet metal gauges, construction and bracing shall comply with the latest SMACNA HVAC Duct Construction Standards.
- B. Flexible connection material shall be neoprene coated glass fabric.
- C. Ductwork shall comply with the standard for 2" static pressure rating.
 - 1. Duct construction, including gauge, transverse join and bracing, shall be in accordance with requirements.
 - 2. Duct supports for horizontal ducts shall be 1" wide galvanized steel bands spaced in pairs not over 8' on centers. Hanger bands shall be bent under lower corners and secured with self-tapping screws at corners and at 6" intervals up the sides.
 - 3. In general, vertical risers and other duct runs, where the method of support specified above is not applicable, shall be supported by substantial angle brackets designed to meet field conditions, and installed to allow for duct expansion.

- 4. Factory fabricated turning vanes shall be installed in all right angle bends in the ductwork, except elbows having a centerline radius 1-1/2 times the greater duct dimension. Turning vanes may be omitted on such elbows.
- 5. Where ducts pass through building construction, the annular space shall be packed with safing insulation and sealed with non-hardening caulk.
- 6. A tight seal shall be provided in all duct in strict accordance with the above referenced SMACNA standard.

2-08 FLEXIBLE INSULATED DUCT

- A. Low pressure (2" S.P. and under) shall be constructed as follows:
 - 1. Core Liner: Flexible acoustically aluminum foil, fiberglass, and polyester sheet liner bonded to galvanized spring steel wire helix.
 - 2. Insulation: 1" thick glass fiber 1 lb. density.
 - 3. Vapor Jacket: Flexible reinforced aluminum sheet having perm rating .05.
 - 4. Rating: U/L-181 Class 1 Air Duct, rated and labeled 2.0" static pressure, 4,000 FPM velocity.
 - 5. Final connections from ducts to ceiling diffusers may be made with flexible duct not greater than 3'-0" in length.
- B. All flexible duct and insulations shall meet the requirements of NFPA-90A for flame spread not exceeding 25 or smoke developed over 50.

2-09 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated. Dampers shall have 16 gage frame and minimum 18 gage blades.
- B. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch, or for round dampers.
- C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- E. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Rod shall be 1/2" square or round.
- F. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2-10 HANGERS AND SUPPORTS

- A. Hangers for support of horizontal piping shall be vertically adjustable hangers with malleable swivel ring or wrought steel clevis type hanger suspended on threaded steel rod hangers. Clevis type hanger shall be utilized for larger piping.
- B. All vertical piping shall be supported at each floor with riser clamps. Riser clamps shall be properly anchored to the building.
- C. Hanger locations shall not exceed a distance of 2'-6" from a point of change in piping direction and shall be spaced in accordance with the following schedule:

Pipe Size	Distance
1" or smaller 1-1/4" - 1-1/2"	6'-0" o.c. 8'-0" o.c.
2" - 2-1/2"	10'-0" o.c.

D. Hangers shall be suspended from mild steel rods sized in accordance with the following table:

Pipe Size	Rod Diameter		
2" and smaller	3/8" dia. rod		
2-1/2" - 3"	1/2" dia. rod		

- E. Pipe coverings shall be protected at each supporting unit with protection saddles made of steel that will transmit the load of the pipe line directly to the supporting unit without damage to the covering.
- F. Install anchors of suitable design and adequate strength for guidance of piping subjected to expansion and contraction due to temperature changes. Anchors shall be securely attached to the building frame.
- G. Provide all necessary steel frame supports, anchor bolts, sleeves, etc., as required for safe support of equipment and piping installed under this contract. Concrete foundations for equipment, roof curbs and other such items of general construction nature will be provided under the general construction sections of the specifications. The Contractor shall be completely responsible for the accurate position and dimensions of all foundations.

2-11 MOTOR AND MOTOR CONTROLLERS

- A. Motors for driving heating, ventilating and air conditioning equipment, except as specified herein, shall be furnished by suppliers of such equipment and shall be the type that has characteristics suitable for continuous operating conditions. Motors shall consist of NEMA frame construction, 40 degree C temperature rise, suitable for the available electric current characteristics, and have quiet operating bearings.
- B. Motor controllers shall be of a single manufacture and of the type indicated on the plans. All starters shall be equipped with three overload relays and external reset. Provide integral or detached contacts, indicating lights, and other accessory features as required.

2-12 UNIT HEATERS

- A. Finish: Factory apply baked enamel on visible surfaces of enclosure or cabinet.
- B. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings.
- C. Motor: Vertical models with grease lubricated ball bearings.
- D. Control: Local disconnect switch.
- E. Capacity: As indicated on drawings.

2-13 POWER ROOF VENTILATORS

- A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.
- D. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.
- E. Ventilators shall be manufacturer's standard, AMCA approved, and direct drive or belt drive as indicated on the plans. Fans shall be the centrifugal type with fan blades of an air-foil design and a fabricated housing of spun aluminum. Accessories shall include birdscreen, backdraft damper and disconnect switch. Motors shall be mounted outside the air stream, and so arranged that the motor will be continuously cooled by outside air.
- F. Wall fans shall be propeller type, belt drive, AMCA approved, furnished with wall mounting housing, backdraft damper and weatherhood. Blades shall be welded steel. Fan shall be enamel coated, color selected by Architect.

2-14 PREFABRICATED ROOF CURBS

- A. Furnish and install prefabricated roof curbs for all roof mounted fans. Roof curbs shall match dimensions of fans, shall be insulated, and shall extend to 12" above roofing surface. Curbs shall be sloped to compensate for roof slope.
- B. Curbs shall be provided for other roof penetrations, ductwork, intake, exhaust hoods, piping and the like.
- C. Prefabricated, insulated roof rails with wood nailer shall be installed for condenser units and shall span joist-to-joist.

2-15 HEAT PUMP AIR HANDLING UNIT 2.80

- A. Unit shall be indoor component of a heat pump system. Unit shall consist of forward-curved belt-driven centrifugal fan(s), motor and drive assembly, prewired fan motor contractor, factory-installed refrigerant metering devices, bypass check valves, cooling coil, 2-in. disposable air filters, and condensate drain pans for vertical or horizontal configurations.
- B. Base Unit
 - 1. Cabinet shall be constructed of mill-galvanized steel.
 - 2. Cabinet panels shall be fully insulated with 1/2-in. fire-retardant material. Insulation shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM standards G21 and 22.
 - 3. Unit shall contain PVC condensate drain pans for both vertical and horizontal applications. Drain pans shall have connections on right and left sides of unit to facilitate field connection. Drain pans shall have the ability to be sloped toward the right or left side of the unit to prevent standing water from accumulating in pans.
 - 4. Unit shall have factory-supplied 2-in. throwaway-type filters installed upstream from the cooling coil. Filter access shall be from either the right or left side of the unit.

C. Coils

- 1. Coils shall consist of copper tubes with sine-wave aluminum fins bonded to the tubes by mechanical expansion. Coil tubing shall be internally rifled to maximize heat transfer. Refrigerant line connections shall be made on the same side of the coil.
- 2. Coils shall feature factory-installed thermostatic expansion valves (TXVs) for refrigerant control. The TXVs shall be capable of external adjustment.
- 3. Coils shall have a factory-installed bypass line and check valve assembly around the TXVs to allow liquid flow from the coil to the outdoor unit during Heating mode.

D. Electric Heaters

Heaters shall be factory-supplied as shown on the equipment schedule. Electric heat assembly shall be ETL and ETL, Canada, agency approved, and shall have single-point power wiring. Heater assembly shall include contactors with 24-v coils, power wiring, 24-v control wiring terminal blocks, and a hinged access panel.

E. Thermostat Controls

Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display, remote sensor capability, and Title 24 compliance.

2-16 HEAT PUMP CONDENSING UNIT

A. General

Outdoor-mounted, air-cooled split system heat pump unit shall be suitable for on-the-ground installation on a full level pad. The unit shall consist of a semi-hermetic reciprocating compressor, a fin-tube coil, propeller-type fan, fan motor, refrigeration control devices, and a control box. All components shall be factory assembled as a single unit. A holding charge of R-22 shall be included.

B. Unit Cabinet

- 1. Cabinet shall be constructed of galvanized steel, bonderized, and finished with baked enamel.
- 2. Fan venturi housings and guards shall be assembled on the unit.
- 3. A removable panel shall be provided for access to compressor and control compartments.
- 4. A refrigerant accumulator with a fusible plug relief shall be installed in the cabinet.
- 5. Lifting holes shall be provided to facilitate rigging.

C. Fan

- 1. Propeller fan shall be directly driven by weather-proof motors. Fan motor bearings shall be permanently lubricated.
- 2. Fan shall be arranged for vertical discharge.

D. Compressor/Motor Assembly

- 1. Semi-hermetic, reciprocating-type compressor shall be complete with a motor and oil pump all on a single polished crankshaft.
- 2. Motor stator winding shall be NEMA Class F rated, suitable for operation in a refrigerant atmosphere
- 3. Oil pump shall be automatically reversible.

- 4. Casing shall include discharge shutoff valves, oil level control orifice, oil-pressure regulating valve, and a crankcase oil heater.
- 5. Suction and discharge manifold valves shall be Swedish steel, reed-type flapper valves.
- 6. Pistons and connecting rods shall be high-density aluminum alloy castings. Pistons shall be equipped with automotive-type compression and oil scraper rings.
- 7. Pump-end bearing shall be cast aluminum. Motor-end bearing shall be steel-backed, tin-base babbit type.
- 8. Compressor assembly shall be installed on spring vibration isolators.

E. Coil

Coil shall have copper tubes, aluminum plate fins (copper fins optional), and galvanized steel tube sheets. The fins shall be bonded to tubes by mechanical expansion. Coil shall be circuited for subcooling in cooling mode operation. For refrigerant control, the unit shall be equipped with a liquid line, suction line, and compressor discharge service valves. The unit shall include an accumulator with a fusible plug relief and a reversing valve for effective heat pump operation. Each unit system shall have 3 service ports: one on the suction line, one on the liquid line, and one on the compressor discharge line. Each port shall be capped for leak tightness.

F. Controls and Safeties

Operating controls and safeties shall be factory selected, assembled, and tested. Minimum control functions shall be as listed below:

- 1. Controls:
 - a. Time-delay restart control to prevent compressor short-cycling.
 - b. Defrost control to consist of a time and temperature activated system that initiates defrost mode at selectable intervals of 30, 50, or 90 minutes in response to a temperature signal.
- 2. Safeties:
 - a. High discharge pressure cutout switch.
 - b. Loss-of-charge cutout switch.
 - c. Compressor motor current and temperature overload cutouts.
 - d. Five-minute recycle protection to prevent compressor short cycling.
 - e. Device to hold the compressor off-line until manual reset at the thermostat when any of the following are tripped: High discharge pressure, high compressor motor temperature, or loss of charge.
 - 3. Phase failure protection

G. Electrical Requirements

- 1. Factory supplied and installed transformer shall provide 24 v control voltage.
- 2. All power and control circuit wiring shall comply with local and national codes.

H. Special Features

1. Head Pressure Control:

Control shall vary the fan motor speed in response to the saturated condensing temperature of the unit. The control shall be capable of maintaining a condensing temperature of $100 \text{ F} \pm 10 \text{ F}$ with outdoor temperature at 0 F.

PART 3 - EXECUTION

3-01 WORKMANSHIP, MATERIALS AND EQUIPMENT

A. All work shall be performed in a workmanlike manner and shall present a neat and mechanical appearance when completed.

3-02 COORDINATION

A. The Contractor shall coordinate his work with that of the other contractors on the job in order that there will be no delay in the proper installation and completion of the work. If, in the opinion of the Contracting Officer, any piping, equipment, etc., has been improperly placed or installed due to lack of coordination with other trades, such piping and equipment shall be relocated as directed by the Contracting Officer at the Contractor's expense.

3-03 VERIFICATION OF UTILITIES AND SERVICES

A. Immediately upon commencing construction, and prior to construction of any part of the facility involved in any way with utilities, investigate thoroughly the size, capacity, arrangement and location of utilities. Report any discrepancies or apparent problem involving the project that pertain to utilities. This applies to private as well as public utilities.

3-04 TESTING

- A. Upon completion of work, all equipment shall be cleaned and adjusted for proper operation and any defects discovered shall be corrected before final inspection prior to acceptance.
- B. Refrigerant piping shall be tested and proven tight with 250 lb. test anhydrous carbon dioxide, then all lines shall be evacuated with a vacuum of 28 inches of mercury and held without loss for a period of 24 hours.
- C. All audible air leaks shall be repaired. Ductwork shall be tested for leaks before applying external insulation and before concealing in inaccessible locations.
- D. The above tests shall be made in the presence of the Contracting Officer or his authorized representative.

3-05 MECHANICAL IDENTIFICATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- C. Identify fans, split systems, condensing units, and thermostats with plastic nameplates.
- D. Identify control panels and major control components outside panels with plastic nameplates.

3-06 PAINTING AND IDENTIFICATION

- A. The following protective painting and identification of equipment shall be provided under this division of the work.
 - 1. Equipment including motors and similar factory fabricated and assembled units shall be furnished with factory applied, protective, prime coat paint of finished baked enamel as specified hereinbefore. Equipment surfaces damaged during the course of construction shall be refinished by the Contractor.

- 2. Detached motor controllers, disconnects, etc., shall be identified with metal or plastic plates with etched letters to completely identify the service of the electrical equipment.
- 3. Provide nameplates to identify motor starters, disconnect switches, time clocks, transformers, and miscellaneous electrical equipment as to systems or mechanical equipment served, or specific function as appropriate.
- 4. Nameplates and tags shall correspond to the record drawings.

3-07 PIPING INSTALLATION - GENERAL

- A. Except where indicated otherwise, all piping shall be run concealed above ceilings, and in the furred spaces of the building, except that piping at mechanical equipment rooms and other areas without furred ceilings shall be run exposed.
- B. All piping shall be arranged and installed as indicated on the drawings and shall be straight, plumb, and as direct as possible, forming right angles on parallel lines with building walls.
- C. Locate groups of pipes parallel to each other, spaced at distances to permit applying full insulation and to permit access for servicing.
- D. All piping shall be arranged so as not to interfere with removal of other equipment or devices or to block access to doors, windows, or other access openings.
- E. Piping systems shall be complete and all pipes shall be of size shown or where not shown shall be of sizes required to produce capacities of equipment specified.
- F. Ends of pipe and tubes shall be reamed before being made up into fittings. Screwed joints shall be made up with red lead or an approved compound applied to the pipe threads and not to the fittings.

3-08 INSULATION

A. Insulation shall be applied over clean, dry surfaces after piping has been tested and proven tight. Fittings, valve bodies, etc., where applicable, shall be insulated with factory molded covering or molded by hand with suitable insulating material and binder same thickness as adjoining pipe covering. All insulation shall be installed in strict accordance with manufacturer's recommendations.

3-09 HANGERS AND SUPPORTS

- A. Hanger locations shall not exceed a distance of 2'-6" from a point of change in piping direction.
- B. Pipe coverings shall be protected at each supporting unit with protection saddles made of steel that will transmit the load of the pipe line directly to the supporting unit without damage to the covering.

3-10 MANUFACTURER'S RECOMMENDATIONS

A. All material and equipment shall be installed in strict accordance with the manufacturer of such material and equipment.

B. In the event of discrepancy between manufacturer's recommendations and any requirements of drawings or specifications, Contractor shall notify Contracting Officer in order that the matter can be cleared up prior to any installation of materials or equipment.

3-11 TESTING AND BALANCING

- A. For the purpose of placing these systems in operation according to design conditions and certifying the same, this Contractor shall balance the air distribution systems. The Contracting Officer will not make final inspection until four copies of the balancing and testing records specified below--showing that the air distribution systems have been balanced and are delivering specified quantities--have been submitted to the Contracting Officer for evaluation and approval. The balancing agent shall perform the following tests and compile the following information:
 - 1. Air Systems and Air Distribution Balance:
 - a. Air Handling Equipment Supply, outside air, and return design conditions:

CFM Static - Pressure Motor H.P. Minimum % of Fresh Air Fan R.P.M. Fan Motor Brake Horsepower

Installed Equipment:

Mfg. Size Serial No. Model Motor H.P., Volt, Full Load Amps

Field Test:

Velocity Test for Total Air Supply OSA and Return:

Discharge or Return Duct Size Number of Velocity Readings Duct Average Velocity Total CFM b. Each individual outlet (grilles and/or diffusers) including supply, return and exhaust.

Each outlet shall be identified as to location and area.

Outlet, mfg., and type.

Outlet size.

Outlet free area, core area, or neck area.

Outlet factor.

Required ft. per min. and test result velocity for each outlet.

Required CFM and test results, each outlet.

- c. Each terminal unit should be balanced in accordance with the manufacturer's recommendations.
- d. All tests shall be performed with calibrated Anemotherm, Velometer, Anemometer, or Manometer and Pitot Tube.
- e. All outlets shall be set for air pattern.
- f. All main supply air, return air, outside air and exhaust air quantities shall be adjusted and set for design CFM.
- g. If requested, the Contractor shall conduct tests as listed here in the presence of the Contracting Officer. Changes in pulleys and/or belts, or the additions of necessary dampers for correct air balance shall be provided and installed by this Contractor at no additional cost.
- 1. Included as a part of his original submittal, this Contractor shall provide for the use of the balancing agency copies of manufacturer's fan performance data and curves, air handling unit coil flow curves, and air distribution balancing data.
- 2. In all cases, the design capacity shall be listed as well as the final operating capacity.
- B. All coils shall be cleaned, all filters clean, and all bearings be well lubricated prior to the testing and balancing subcontractor beginning his work.

3-12 CONCRETE PADS FOR MECHANICAL EQUIPMENT

- A. This Contractor shall be responsible for furnishing all required and appropriate concrete pads including anchors for his equipment as indicated on the plans and as specified herein.
- B. All concrete work shall conform to the applicable sections of these specifications for concrete and shall be 3000 pound concrete minimum, with #4 rebar set in on 12" centers for reinforcement and pad thickness shall be 8".

3-13 PREFABRICATED ROOF CURBS

A. Curbs for ducts and pipes through roof and curb rails for support of ducts and pipes above roof shall be secured through roof deck to supporting structural steel below.

B.	Where ducts or pipes pass through curb, provide curb cap secured to duct or pipe waterproof, sloping not less than 1 inch per foot down to curb and turned down for flashing not less than 2 inches. Secure caps to wood nailer of curb.
C.	Bolt pipe and duct supports to wood nailer of curb rails.

DIVISION 16 - ELECTRICAL

SECTION 16010

ELECTRICAL GENERAL REQUIREMENTS

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SECTION 16010

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1-01 SCOPE

- A. General Provisions for the complete electrical system for lighting, power, control, and other purposes, as herein specified and/or indicated on the drawings, consisting generally of, but not limited to, complete and operable systems and components of the following types:
 - 1. Coordination with Entergy, the local electrical utility provider, for electrical service including transformer and metering.
 - 2. Concrete pads for electric utility pad-mounted transformers, conduits for primary electrical service to the transformers and conduits for secondary electrical service to the buildings, all installed per utility company requirements.
 - 3. Service conductors from pad-mounted transformers to switchboards, feeders, branch circuit wiring, and all connections as required for complete functioning of all lighting, power and other electrical requirements.
 - 4. Coordination with BellSouth Telephone Co. for underground telephone/data/comm service.
 - 5. Empty raceway systems for voice and data cabling system and SCADA system.
 - 6. Electrical distribution system including switchboards, automatic transfer switch, power distribution and lighting panelboards, individual motor controllers, motor control centers, dry-type transformers, disconnect switch, and products of the same sort.
 - 7. Branch circuits and outlets.
 - 8. Electrical connection of motor starting equipment provided by other Divisions.
 - 9. Electrical connection of motors and equipment provided by other Sections.
 - 10. Grounding system including equipment ground.
 - 11. Wiring devices.
 - 12. Lighting fixtures, lamps and ballasts.
 - 13. Emergency system including packaged engine generator.
 - 14. Control and interlock wiring, excluding temperature control.

- 15. Concrete pads for floor mounted electrical equipment.
- 16. Connection of all equipment furnished under other Divisions and/or by the Owner, such as pumps, conveyors, presses, process drive motors, disinfection equipment, metering, conveyors, valve controllers, etc.
- 17. Providing empty raceway systems as shown on the Drawings and/or specified herein.
- 18. Mounting and aligning all motors and drives not factory-installed on equipment.
- 19. Testing of all systems furnished, installed, or connected as a part of the Work of Division 16.
- 20. Furnishing of Shop Drawings, Submittals and Brochures.
- 21. Operating and maintenance books.
- 22. Furnishing of Record Drawings as specified herein.
- 23. Miscellaneous items as required for complete and functioning systems as specified herein and indicated on the Drawings.

1-02 RELATED WORK AND APPLICABLE REQUIREMENTS SPECIFIED ELSEWHERE

A. Related Work:

- 1. All DIVISION 16 (Electrical) Sections.
- 2. ALLOWANCES AND OPTIONS
- 3. DIVISION 3 CONCRETE.
- 4. DIVISION 7 WATERPROOFING
- 5. DIVISION 9 PAINTING.
- 6. DIVISION 11 EQUIPMENT.
- 7. DIVISION 13 SPECIAL CONSTRUCTION
- 8. DIVISION 15 MECHANICAL.

1-03 QUALITY ASSURANCE

A. Regulations and Codes: Install this work to the requirements of the 1999 Standard Building Code, the DeSoto County regulations, and to the applicable requirements of

the National Electrical Code. If any work shown on the Drawings, or specified appears to conflict in any way with any regulations and codes, notify the Contracting Officer before performing work.

- B. Permits and Fees: Pay all permits, fees, etc., required for the work in Division 16, except for any charges for permanent electrical service, which the Owner pays direct to the utility involved. Be responsible for all coordination and scheduling with utility companies.
- C. Standards: In addition to applicable codes, the following industry standards, specifications and codes are minimum requirements. Standards are referenced to hereinafter in accordance with the following abbreviations:
 - 1. NEMA The National Electrical Manufacturer's Association Standards.
 - 2. ICEA The Insulated Cable Contracting Officer's Association Standards.
 - 3. UL Underwriters' Laboratories, Inc., Standards.
 - 4. ANSI American National Standards Institute.
 - 5. ETL Electrical Testing Laboratories, Inc. Standards.
 - 6. CBM Certified Ballast Manufacturers, Standards.
 - 7. EIA Electronics Industry Association.
 - 8. NECA National Electrical Contractors Association
 - 9. NEC National Fire Protection Association 70, National Electrical Code, 1999.
 - 10. NFPA National Fire Protection Association.

1-04 SUBMITTALS

A. Submittal Data Brochures:

1. Submit all equipment, with descriptive data, to the Contracting Officer for approval. Submit all equipment, including items called out on drawings in indexed, three-ring binders (sized appropriately for the mass of contents) for the electrical Sections, with a minimum number of copies as indicated in Section 00800. First submittal should include materials needed first for construction and long lead-time items. Do NOT combine all submittals into one brochure; Contracting Officer will return submittals received in this fashion without review for re-submittal. Separating submittals allows the Contracting Officer to review and return submittals with less turn-around time. Submit all items in a specification section at one time; partial submittals will not be considered. Do not employ faxed or other unclear copy in brochure preparation. Combine submittals in binders as follows:

Binder 1: Sections 16050, 16060, 16070, 16075, 16123, 16131, 16210

Binder 2: Sections 16138, 16139, 16140

Binder 3: Sections 16413, 16423, 16480, 16481, 16482

Binder 4: Sections 16231

Binder 5: Sections 16272, 16273, 16411, 16412, 16426, 16443, 16491

Binder 6: Sections 16510

- a. Booklet 1 Fixtures
- b. Booklet 2 Ballasts
- c. Booklet 3 Lamps
- 2. Retain three (3) of the above copies for use in preparing as "Operating and Maintenance" manuals after approval of equipment.
- 3. Submit brochures describing material and equipment to the Contracting Officer for approval within 60 days of signing of the General Construction contract.
- 4. Where substitute items are proposed, make submittal as described in Section 00800 section regarding substitutions.

B. Operating and Maintenance Manuals:

- 1. Deliver to the Contracting Officer three (3) complete operating and maintenance manuals covering all equipment and systems installed by this Division.
- 2. Include parts lists, wiring diagrams, and operating instructions for all operating equipment as well as all contents of the approved submittals and copies of field tests.
- 3. Bind manuals in hard back three ring binder and tab indexed to reflect various categories of materials. Label front cover and back spine indicating project name. Include page showing date and local responsible vendors with addresses and telephone numbers for furnishing parts and information on equipment.

C. Test and Inspection Reports:

- 1. Provide copies of all test or inspection reports by public agencies for electrical system.
- D. Provide the following shop drawings, number of copies as required elsewhere in this specification:
 - 1. As required by Contracting Officer where deviations are to be, or have been made from Contract Documents.

2. Mechanical and Electrical Equipment Rooms at 1/4" = 1'-0". Include electrical information with mechanical drawings. Submit sheet size of same size as the Contract Documents.

1-05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Make provisions for the delivery and safe storage of all materials, and arrange for the introduction into the building of equipment too large to pass through finished openings. Provide moisture and dirt protection for materials as appropriate.
- B. Arrange to have materials delivered to the job at such stages of the work as will expedite the work as a whole. Mark and store all materials in such a manner as to be easily checked on inspection.
 - C. Where materials are indicated to be furnished to this Division for installation and/or connection, make a complete and careful check of all materials thus received and furnish a receipt acknowledging acceptance of the delivery and condition of the materials received. After such acceptance, assume full responsibility for the safe-keeping of same until such time as the completed installation has been approved and accepted.

1-06 JOB CONDITIONS

A. Examination of Site:

- 1. Visit the site of the work before submitting bids and satisfy themselves as to the nature and scope of all work to be done, or required by local authorities to be done, to meet with their requirements or codes.
- 2. The submission of a bid is taken as evidence that such an examination has been made and difficulties, if any, noted and dealt with by inclusion in bid or listed as an exclusion from bid.

B. Coordination:

1. Coordinate all work with that of others on the job, in order that there are no delays in the proper installation and completion of the work. Perform extra work or materials resulting from lack of coordination without additional cost.

C. Openings through walls, floor and roof:

1. Ascertain that all openings through walls, floors, ceilings and roofs and through any other parts of the structure shall be properly sized and located. Prepare and furnish to the General Contractor a sleeve plan for all sleeves required in proposed structure. Set all required sleeves in concrete, and/or be responsible for same. Make all openings so as to maintain fire rating and water integrity of structure.

- 2. All framed openings in proposed structure are constructed by another Section; locations furnished herein.
- 3. Make all roof penetrations watertight and comply with requirements to maintain integrity of roof.
- 4. Provide U.L. approved devices/seals to close and maintain fire rating of penetrations of fire-rated floors and partitions by raceways and cabling.

D. Protection of Work:

- 1. Protect installation at all times from danger by freezing, breakage, dirt, foreign materials, damage from the practices of other trades, etc., and replace all work so damaged.
- 2. Use every precaution to protect the work of others, and be responsible for all damage to other work caused by work of or through the neglect of workmen under this Division of the Specifications.
- 3. Protect raceway openings with temporary plugs or caps. At locations where conduits are turned upward in the field, flag the location to alert other trades to the presence of the conduits.

1-07 USE OF DOCUMENTS

- A. Drawings and Specifications together describe the project. Any provisions occurring in one are considered to occur in both. Where discrepancies occur between Drawings and Specifications, the more stringent requirements prevail.
- B. Indicate loads connected to electrical branch circuits; however, routing of conduit may be rearranged, where specifically approved by Contracting Officer to best fit conditions.
- C. Refer to the various working drawings for other trades in order that work required conforms in detail with the work of others. Careful planning is required for all exposed overhead work to obtain an inconspicuous installation.
- D. Additional compensation is not allowed for any labor or material unless Contractor can clearly show same to be an addition beyond the requirements of the Drawings and/or Specifications.
- E. The Drawings are diagrammatic; therefore, for all dimensions and exact locations, refer to the present building or to Contracting Officering and Structural Drawings unless specifically noted otherwise.
- F. In preparation of the Drawings it is intended that they be utilized by competent mechanics in completing the system installations.

G. Install equipment in accordance with manufacturer's recommendations and keep a copy of these recommendations on the job site at all times. Make these installation recommendations available to the Contracting Officer upon a request for same.

1-08 RECORD (AS-BUILT) DRAWINGS

- A. Prepare record drawings of all systems installed herein. Prepare drawings utilizing blue-line or black-line prints of the bidding drawings. Follow standard symbols and drafting techniques. After submitting and obtaining the Contracting Officer's approval of the record drawings, deliver to the Contracting Officer, copies of the approved drawings.
- B. Each day neatly post to the job site record set of drawings notations to indicate work progress and information for record drawings. Post work performed with colored pencils coded to the various systems. Incorporate all changes and departures from bidding drawings. Show principal dimensions of all concealed work. Show all piping encountered in excavation work.
- C. Contracting Officer makes monthly inspections of job site record set. Approval of monthly payments is dependent on maintain current record set drawings.
- D. Bear all costs for printing, drafting, record keeping, etc., involved in preparation of the above record drawings.
- E. Refer to Section 00800 regarding Record Documents.

1-09 GUARANTEE

- A. Guarantee all work performed to be free from defects in workmanship and materials for the period specified in Section 00800 from date of final acceptance. Lamps are excluded from guarantee; however, one complete and operative set must be in place at time of final acceptance.
- B. Remedy promptly defects arising during this period at no expense to the Government, upon notice by the Contracting Officer.

PART 2 - PRODUCTS

2-01 GENERAL

- A. Provide materials and workmanship involved in the specified installation properly applied for the purpose intended and of high quality. Contracting Officer reserves the right to reject any materials and workmanship not in accordance with those specified, either before or after installation. Provide only new materials which be have been inspected and approved by Underwriters Laboratories, Inc., and bear the appropriate U.L. label.
- B. For materials and/or equipment specified herein:

- 1. Where specifications state "no substitution", substitutions are not permitted.
- 2. Where specification states "Manufacturers: Subject to compliance with requirements, provide products by one of the following:" or, if specification does not state "or approved equal", then substitutions are only considered during the bid period and only if requested in writing and issued as an Addendum.
- 3. If specification lists manufacturers and states "or approved equal", then products by an alternate manufacturer may be submitted to the Contracting Officer for approval, provided all space requirements, capacities and features specified are met.

2-02 SAFETY DEVICES

- A. Provide suitable guards to enclose wire connections, electrical contacts, etc. Use sheet metal, wire mesh or insulating material as applicable, rigidly secured so equipment is readily removable.
- B. Provide warning signs to caution personnel of possible dangers.

PART 3 - EXECUTION

3-01 GENERAL

- A. Inspect job site thoroughly at commencement of work and plan execution of work around conditions prevailing.
- B. Thoroughly plan execution of the work with respect to all trades. Lay out all openings and systems specifically listed herein and otherwise as required.
- C. Place and arrange all equipment so that all items requiring periodic service are accessible, including all motors, controllers, relays, lamps and such related items.

3-02 WORKMANSHIP

A. Utilize mechanics competent in their respective fields to install all work. The installation is at all times to be under supervision of a supervisor who is thoroughly familiar with all portions of the installation.

B. Perform all work in a finished and workmanlike manner in accordance with NECA 1 and best standards of the trade.

3-03 TESTING AND ADJUSTMENTS

- A. Perform all tests as specified in the various Sections and/or required by applicable codes.
- B. Test auxiliary systems for proper operation and thoroughly familiarize operating personnel with the proper operating procedure of each system. Provide "along-side" instructions for operating personnel on all systems.
- C. Check and adjust all equipment to operate smoothly, quietly and according to manufacturer's recommendations.
- D. Provide all testing equipment including instruments, etc. and prepare all reports.

3-04 SUPPORTS

A. Provide all supports required for electrical installation. Coordinate with construction of partitions to the end that studs are located and stiffened and thickened as required for support of wall mounted equipment.

3-05 CLEAN-UP

- A. Maintain premises free from accumulation of waste materials rubbish caused by work herein.
- B. At the completion of the work, remove all surplus materials, tools, etc., and leave the premises "broom-clean". Clean all fixtures and equipment and remove all paste-on tags. Clean all items and leave them in a clean condition free of dust, dirt and all foreign materials, including interiors of switch and outlet boxes, panels, etc.

DIVISION 16 - ELECTRICAL

SECTION 16030

ELECTRICAL SYSTEMS SCHEDULE

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PART 1 – GENERAL

1-01 SYSTEM DESCRIPTION

1-02 SYSTEMS

SECTION 16030

ELECTRICAL SYSTEMS SCHEDULE

PART 1 - GENERAL

1-01 SYSTEM DESCRIPTION

- A. Provide materials and labor to produce a complete and operative electrical system. In the course of construction coordinate electrical work with the general construction shop and field drawings, manufacturer's recommendations and installation instructions.
- B. The plans for the electrical work are diagrammatic and the technical specifications are descriptive, and do not show every piece of equipment, conduit, wiring boxes, etc. Where any mention of a system or system operation is indicated in the contract documents, provide material and labor for that system to be fully operational to the satisfaction of the Contracting Officer.
- 1-02 SYSTEMS The following operative systems are applicable to the Work:
- A. Secondary underground 480/277 volts electric service and distribution system. Provide system complete with trenching and backfilling, raceways, concrete encasement, conductors, terminations and testing.
- B. Standby power generating system and connections to equipment.
- C. Power distribution system (600 volts and below) complete with raceways, ductbanks, manholes, pullboxes, conductors, motor control center, panels, transformers, lighting systems, motors and auxiliary equipment controls, and connections thereto.
- D. Lighting systems, complete with fixtures, lamps, accessories, mounting hardware, etc.
- E. Grounding system of ground rods, grounding loops, connectors.
- F. Telephone conduit system consisting of boxes, backboard, trenching and backfilling, pullboxes, manholes, etc., to provide pathways for telephone cables. Providing telephone cables and equipment is not a part of the Work.
- G. Raceway system with pullwire or pullcable for the installation of controls and instrumentation cables.
- H. Other miscellaneous systems as may be described in the Project Manual or described on the Drawings.

DIVISION 16 - ELECTRICAL

SECTION 16050

BASIC MATERIALS AND METHODS

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SECTION 16050

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1-01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1-02 SUMMARY

- A. This Section includes the following electrical materials and methods to complement other Division 16 Sections:
 - 1. Sleeves.
 - 2. Concrete equipment bases.
 - 3. Touchup painting.
 - 4. Installation requirements common to equipment specification sections.
 - 5. Cutting and patching for electrical construction.
 - 6. Empty raceway systems.
 - 7. Sealing for raceway penetrations of fire-rated walls, floors and roof assemblies.
 - 8. Escutcheons.
 - 9. Mechanical sleeve seals.
 - 10. Joint sealers.
 - 11. Access doors.
 - 12. Excavation and backfill.

1-03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings and unexcavated spaces.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1-04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For mechanical sleeve seals.
- C. Coordination Drawings for electrical installation.
 - 1. Prepare Coordination Drawings according to Section 00800 to a 1/4-inch-equals-1-foot scale or larger. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for installation, access, and working clearance. Coordinate drawing preparation with effort specified in other Specification Sections. Include floor plans of equipment rooms and/or spaces where electrical equipment is installed, elevations, and details indicating and identifying the following:
 - a. Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - b. Exterior wall, roof, and foundation penetrations of raceway; and their relation to other penetrations and installations.
 - c. Fire-rated interior wall and floor penetrations by electrical installations.
 - d. Sizes and locations of required concrete equipment bases.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70 for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are Underwriters Laboratories listed and labeled, as defined in the National Electrical Code, Article 100.

1-06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site in original factory carton or bundles with labels informing about manufacturer, product name and designation and UL labeling
- B. Protect stored products from moisture and dirt, elevated above grade or floor. Do not exceed the structural capacity of floor, if stored inside.

1-07 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
- C. Coordinate installing required outlet boxes and supporting devices, and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.
- E. Coordinate connecting electrical service to components furnished under other Sections.
- F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."

PART 2 - PRODUCTS

2-01 SLEEVES

- A. The following materials are for walls and slabs above grade:
 - 1. Sleeves for cables: Epoxy fiberglass conduit.
 - 2. Sleeves for conduit: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

2-02 CONCRETE EQUIPMENT BASES

- A. Forms and Reinforcing Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2-03 TOUCHUP PAINT

- A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- B. For None equipment Surfaces: Matching type and color of undamaged, existing adjacent finish.
- C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3-01 EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- B. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Give right of way to raceways and piping systems installed at a required slope.

3-02 INSTALLATION

- A. Install devices to securely and permanently fasten and support electrical components.
- B. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 1. Conform to manufacturer's recommendations for selecting and installing supports.
 - 2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
 - 4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 - 5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 - 6. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
 - 7. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and

- smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports.
- 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- C. Vertical Conductor Supports: Install simultaneously with conductors.
- D. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panel boards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- E. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- F. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls. Provide mechanical sleeve seals where sleeves penetrate exterior walls above and below grade, slab on grade, and roof slab. Conduit smaller than 1-1/4" diameter trade size do not require sleeves through an above grade slab if the conduits are installed prior to the structural slab being poured.
- G. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
 - 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
 - 2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
 - 3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
 - 4. In partitions of light steel construction use sheet-metal screws.
 - 5. Drill holes in concrete beams so holes more than 1-1/2 inches deep do not cut main reinforcing bars.

- 6. Drill holes in concrete so holes more than 3/4 inch deep do not cut main reinforcing bars.
- 7. Fill and seal holes drilled in concrete and not used.
- 8. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.
- H. Install concrete pads and bases according to requirements of Division 3 Section "Castin-Place Concrete."
- I. Install utility-metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by company.

3-03 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3-04 TOUCHUP PAINTING

- A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

3-05 EMPTY RACEWAY SYSTEMS, TELEPHONE SYSTEMS

A. Contractor shall provide empty conduit and box system, as indicated on Drawings, for telephone, data/communications, sound, paging, monitoring and security systems.

3-06 ESCUTCHEONS

A. Provide chrome plated escutcheon plates on raceways where exposed raceways penetrate finished floors, ceilings or walls with escutcheons installed tight to the finished surface.

3-07 MECHANICAL SLEEVE SEALS

A. Where an underground raceway enters the building through a membrane-waterproofed wall or floor, an approved malleable-iron, watertight entrance sealing device (such as Link-Seal by Thunderline Corp.) shall be provided. Each end of the Device shall have a gland type sealing assembly with pressure bushings, which may be tightened at any time. When there is a concrete envelope specified or shown on the drawings, a sealing gland assembly shall be on the inside. The device shall be securely anchored into the masonry construction with one or more integral flanges. The membrane waterproofing shall be secured to the device in a permanently watertight manner.

3-08 JOINT SEALERS

- A. General: Joint sealers, joint fillers and other related materials compatible with each other and with joint substrates under conditions of service and application.
- B. Colors: As selected by the Architect from manufacturer's standard colors.
- C. Elastomeric Joint Sealers: Refer to Division 7 for material specification.
- 3-09 ACCESS DOORS
- A. Provide access doors where required for access to electrical equipment or pullboxes.
- 3-10 EXCAVATION AND BACKFILL
- A. Excavation and backfill by Division 16 shall be in accordance Division 2.

DIVISION 16 - ELECTRICAL

SECTION 16060

GROUNDING

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SECTION 16060

GROUNDING

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems.
- B. Ground Rods.
- C. Ground Rings.
- D. Exothermic Welded Connections and Materials.
- E. Grounding and bonding conductors.
- F. Grounding connectors, clamps, and bushings.
- G. Ground conductors in raceways.
- H. Division 16 Section "Wires and Cables" for requirements for grounding conductors.

1-02 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for grounding rods, connectors and connection materials, and grounding fittings.
- C. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Field tests and observation reports certified by the testing organization and indicating and interpreting the test reports for compliance with performance requirements.

1-03 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with UL 467.

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C. Listing and Labeling: Provide products specified in this Section that are listed and labeled, as defined in the National Electrical Code, Article 100.

PART 2 - PRODUCTS

2-01 GROUNDING AND BONDING PRODUCTS

A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2-02 WIRE AND CABLE GROUNDING CONDUCTORS

- A. Comply with Division 16 Section "Wires and Cables." Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- B. Equipment Grounding Conductors: Insulated with green color insulation.
- C. Grounding-Electrode Conductors: Stranded cable.
- D. Underground Conductors, direct buried: Bare, tinned, stranded, except as otherwise indicated.
- E. Bare Copper Conductors: Conform to the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.

2-03 MISCELLANEOUS CONDUCTORS

- A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 AWG bare copper wire, terminated with copper ferrules.
- C. Bonding Straps: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2-04 CONNECTOR PRODUCTS

- A. Pressure Connectors: High-conductivity-plated units.
- B. Bolted Clamps: Heavy-duty type.
- C. Exothermic-Welded Connections: Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

2-05 GROUNDING ELECTRODES

A. Grounding Rods: Copper-clad steel with a minimum of 27 percent of rod weight in copper cladding; size: 3/4 inch by 120 inches, driven.

PART 3 - EXECUTION

3-01 APPLICATION

- A. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 - 1. Install equipment grounding conductor with circuit conductors for the items below in addition to those required by Code:
 - a. Feeders and branch circuits.
 - b. Lighting circuits; required in switch drops since device plates are metal.
 - c. Receptacle circuits.
 - d. Single-phase motor or appliance branch circuits.
 - e. Three-phase motor or appliance branch circuits.
 - f. Flexible raceway runs.
 - g. Process equipment power branch circuits.
 - 2. Isolated Grounding-Receptacle Circuits: Install a separate insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at the equipment grounding-conductor terminal of the applicable derived system or service, except as otherwise indicated.
 - 3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables, or for electrical service entrance.
 - 4. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and above, including air cleaners and heaters. Bond conductor to each unit and to air duct.
 - 5. Water Heater, Heat-Tracing, and Anti-frost Heater Circuits: Install a separate equipment grounding conductor to each electric water heater, heat-tracing assembly, and anti-frost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
- B. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide a No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system to each service location terminal cabinet.
 - 1. Service Locations and Wiring Closets: Terminate grounding conductor on a ¼-inch x 2-inch x 6-inch grounding bus.

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- 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- C. Separately Derived Systems: Where NEC requires grounding, ground according to NEC Paragraph 250-26.
- D. Bonding: Where a metallic raceway is used as protection for a grounding conductor. Each end of the raceway shall be bonded to the grounding conductor.
- E. Metal Water Service Pipe: Connect main metal water service pipes to the building grounding electrode conductor if the main metal water service pipes are in full contact with earth for at least 10 feet of length.

3-02 INSTALLATION

- A. General: Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- B. Electrical Room Grounding Bus: Space 1 inch from wall and support from wall 6 inches above finished floor, except as otherwise indicated.
- C. Grounding Rods: Locate a minimum of 1-rod length from each other and at least the same distance from any other grounding electrode.
 - 1. Drive until rod tops are 2 inches below final grade outside the building and 8" above finished floor inside the building, except as otherwise indicated.
 - 2. Interconnect with grounding-electrode conductors. Use exothermic welds, except as otherwise indicated. Make these connections without damaging copper coating or exposing steel.
- D. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- E. Underground Grounding Conductors: Use bare copper wire. Bury at least 24 inches below grade.
- F. Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding-clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install a grounding jumper across dielectric fittings. If grounding conductor is installed in metal raceway, bond grounding-conductor conduit to conductor at each end.
 - G. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.

- H. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NEC Paragraph 250-81(c), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. Where base of concrete foundation is less than 20 feet in length, coil excess conductor within base of concrete foundation. Bond grounding conductor to reinforcing steel and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or structure ground loop.

3-03 CONNECTIONS

- A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding-Wire Terminations: For No. 6 AWG and larger, use pressure-type grounding lugs. No. 8 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Non-contact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A.

- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3-04 FIELD QUALITY CONTROL

- A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE 81.
- B. Maximum resistance to ground value: 25 ohms.
- C. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.
- D. Report: Prepare test reports of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3-05 ADJUSTING AND CLEANING

A. Restore surface features, including vegetation, at areas disturbed by work of this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after back-filling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 2 Sections "Trees, Plants and Ground Cover" and "Sodding". Maintain restored surfaces. Restore disturbed paving as indicated.

DIVISION 16 – ELECTRICAL

SECTION 16070

HANGERS AND SUPPORTS

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SECTION 16070

HANGERS AND SUPPORTS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1-02 REFERENCES

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association, 2000.
- B. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.

1-03 SUBMITTALS

- A. See Section 00800 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.

1-04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2-01 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; hot dip galvanized after fabrication.

C. Anchors and Fasteners:

- 1. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
- 2. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
- 3. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- 5. Solid Masonry Walls: Use expansion anchors or preset inserts.
- 6. Sheet Metal: Use sheet metal screws.

- 7. Wood Elements: Use wood screws.
- D. Formed Steel Channel:
 - 1. Product: Indoor- 1.5" x 1.5" galvanized steel, painted.
 - 2. Product: Exposed to weather 1.5" x 1.5" stainless steel or fiberglass

PART 3 EXECUTION

3-01 INSTALLATION

- A. Install hangers and supports as required to support adequately and securely electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
 - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or other conduit.
 - 2. Do not drill or cut structural members.
 - 3. Obtain permission from Contracting Officer before drilling or cutting structural members.
 - 4. Do not use perforated metal strap hangers.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. Provide stainless steel bolts, nuts and washers for attachments exposed to weather.
- D. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- E. In wet, damp and outdoor locations, use stainless steel channel supports to stand cabinets and panelboards 1 inch off wall. Where walls are not available for mounting provide field fabricated stainless steel racks; set in concrete bases 18 inches deep x 12 inches diameter unless otherwise on the drawings.
- F. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- D. Provide two-hole, U-shaped, 14 gage minimum, conduit straps for conduits secured hard against concrete or steel structure.
- E. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 1. Conform to manufacturer's recommendations for selecting and installing supports.
 - 2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
 - 4. Spare capacity: Size supports for multiple conduits so capacity can be increased by a minimum of 25 percent in the future.
 - 5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.

- 6. Hanger rods: ¼-inch diameter, or larger, threaded steel rods, except as otherwise indicated.
- 7. Spring steel fasteners: Use products specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports.
- 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- F. Miscellaneous metal channel racks used indoors for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- In open overhead spaces, cast boxes threaded to raceways do not need to be supported separately, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

DIVISION 16 - ELECTRICAL

SECTION 16075

ELECTRICAL IDENTIFICATION

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SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1-02 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association, 1999.

PART 2 - PRODUCTS

2-01 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Locations:
 - 1. Each electrical distribution and control equipment enclosure.
 - 2. Communication cabinets.
 - 3. Safety switches.
- C. Letter Size:
 - 1. Use 3/8 inch letters for identifying individual equipment and loads.
 - 2. Use 3/4 inch letters for identifying grouped equipment and loads.
 - 3. Use 1/4 inch letters for identifying safety switches/disconnects.
 - D. Labels: Embossed adhesive tape, with 3/16-inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations, and for indoor use only.

2-02 WIRE MARKERS

- A. Description: tape-type wire markers.
- B. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

C. Legend:

- 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
- 2. Control Circuits: Control wire number indicated on shop drawings.

2-03 CONDUIT MARKERS

- A. Description: tape or split sleeve.
- B. Location: Furnish markers for each conduit longer than 6 feet, installed above grade or indoors.
- C. Spacing: 20 feet on center.
- D. Color:
 - 1. 480 Volt System: yellow.
 - 2. 208 Volt System: light blue.
 - 3. Telephone System: black.
 - 4. Controls System: orange.
- E. Legend:
 - 1. 480 Volt System: 480 volts.
 - 2. 208 Volt System: 120/208 volt.
 - 3. Telephone System: Tele/Comm.
 - 4. Controls System: Controls.

2-04 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, detectable type colored yellow with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3-01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3-02 INSTALLATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplates to equipment front using stainless steel screws.
- C. Identify underground conduits using underground warning tape. Install one tape per trench at 12 inches below finished grade.

DIVISION 16 - ELECTRICAL

SECTION 16123

BUILDING WIRE AND CABLE

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BUILDING WIRE AND CABLE

PART 1 GENERAL

1-01 SECTION INCLUDES

- A. Wire and cable for 600 volts and less.
- B. Wiring connectors and connections.

1-02 REFERENCES

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association: 2000.
- B. NFPA 70 National Electrical Code; National Fire Protection Association; 2002.
- C. NEMA WC3 rubber insulated wire.
- D. NEMA WC5 thermoplastic insulated building wire.

1-03 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide for each wire type used and wire connectors.
- C. Test Reports: Indicate procedures and values obtained.
- D. Project Record Documents: Record actual locations of components and circuits.

1-04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2-01 WIRING REQUIREMENTS

- A. Use only copper conductors. Aluminum wire is not allowed.
- B. Use conductor not smaller than 12 AWG for power and lighting circuits.
- C. Use conductor not smaller than 14 AWG for control circuits.
- D. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- E. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

2-02 BUILDING WIRE

A. Description: Single conductor insulated wire.

- B. Conductor: Copper.
- C. Construction:
 - 1. For sizes smaller than 8 AWG use solid conductor.
 - 2. For sizes larger than 8 AWG use stranded conductor.
 - 3. For connections to motors and transformers, all sizes, use stranded conductor.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation: NFPA 70, Type THHN/THWN-2.

2-03 WIRING CONNECTORS

- A. Solderless Pressure Connector with Insulating Plastic Covers: for conductors 8 AWG and smaller. Temperature rating of connectors equal to that of the wire on which they are used. Encase connectors used in wet locations with suitable sealant-filled waterproof cover.
- B. Compression Connectors: for conductors larger than 6 AWG. Terminate incoming conductors to the Power Control Center main breakers with UL Listed high conductivity wrought copper color-keyed compression lugs. Use one hole lugs on conductors 4/0 AWG and smaller; use two-hole lugs on conductors larger than 4/0 AWG. Make two-way splices with UL Listed barrel connectors (copper) requiring compression on each end. Make taps and pig-tail connections using UL Listed "C" type copper compression taps. Use the compression connector manufacturer's recommended installing tools with required number of compressions for all terminations. For splices made in in-ground junction boxes, pullboxes or manholes, and in wet locations, provide suitable UL Listed sealant-filled waterproof covers.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Examine raceways to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected
- B. Verify that mechanical work likely to damage wire and cable has been completed.
- C. Verify that raceway installation is complete and supported.

3-02 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.
- B. Splice conductors only in accessible junction boxes.
- C. Terminate spare conductors with twist-on connector secured with vinyl insulating electrical tape.

3-03 INSTALLATION

- A. Install all wiring in raceways.
- B. Identify each circuit with its circuit number or other designation indicated, according to Section 16075.
- C. Color code power and lighting conductors and cable.
- D. Color coding (power system): Use the following conductor color coding:

480/277 Volts System
Phase A - Brown
Phase B - Orange
Phase C - Yellow
Neutral - Gray
Ground - Green
Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green
Phase A switch leg - Gray
Phase B switch leg - Pink

Travelers - Yellow

Phase C switch leg - Purple

- E. Install wire securely, in a neat and workmanlike manner, as specified in NECA 1.
- F. Route wire and cable as required to meet project conditions, using wiring methods indicated.
- G. Pull all conductors into raceway at same time.
- H. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- I. Protect exposed cable from damage.
- J. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- K. Clean conductor surfaces before installing lugs and connectors.
- L. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- M. Insulate splices and taps with heat- or cold-shrink vinyl plastic tubing or covers, or with vinyl plastic insulating tape (such as Scotch #33) applied to a thickness equal to or greater than the thickness of the conductor insulation.
- N. Provide a insulated ground wire, sized in compliance with the NEC in each raceway. In control circuit raceways, provide a 12 AWG insulated ground wire.
- 3-04 FIELD QUALITY CONTROL
- A. Perform field inspection and testing in accordance with Section 01400.
- B. Inspect and test for physical damage and proper connection.
- C. Tighten conductor connections and terminations to UL 486A recommended values
- D. Verify proper phase rotation and connections.

E. Test insulation resistance of conductors using Biddle megger of not less than 500V DC. Measure resistance by connecting one terminal of the megger to the conductor and the other to the metal raceway in which it is installed. Observe and record the megger reading after 15 seconds of operation of the megger at slip speed. Testing of conductors size 8 AWG and smaller may be made using a standard ohm meter. Acceptable minimum insulation resistance for conductors rated 600 volts are:

#8, #10, #12 and #14 250,000 ohms #2, #3, #4, #6 100,000 ohms #4/0, #3/0, #2/0, #1/0, #1 50,000 ohms 250kcmil and larger 25,000 ohms

- F. Remove and replace all conductors and splices on which test results do not exceed the insulation resistance values listed above. Provide instruments and personnel required for tests; tabulate readings observed four copies of test readings to the Contracting Officer for review.
- G. On test reports identify each serve, feeder, and branch circuit conductor tested. On the report indicate the date and time of test, weather conditions, and relative humidity. The individual making the test and the person witnessing the test report must legibly sign each test report. Include a copy of the final test reports in the Operation and Maintenance Manual.
- H. Subsequent to connecting conductors energize circuits and demonstrate functioning in accordance with requirement. Correct all malfunctioning units and retest to demonstrate compliance.

DIVISION 16 - ELECTRICAL

SECTION 16131

CONDUIT

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CONDUIT

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Conduit, fittings and conduit bodies.

1-02 RELATED SECTIONS

- A. Section 16060 Grounding and Bonding.
- B. Section 16070 Hangers and Supports.
- C. Section 16075 Electrical Identification.
- D. Section 16138 Boxes.

1-03 REFERENCES

- A. ANSI C80.1 American National Standard Specification for Rigid Steel Conduit -- Zinc Coated; 1995.
- B. ANSI C80.3 American National Standard Specification for Electrical Metallic Tubing -- Zinc Coated; 1995.
- C. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- D. NECA 101 Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2001.
- E. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies; National Electrical Manufacturers Association; 1993.
- F. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide for outer-coated PVC rigid metallic conduit, metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, fittings, and conduit bodies.
- C. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches.

1-05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1-06 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 PRODUCTS

2-01 CONDUIT REQUIREMENTS

- A. Install all wiring in conduit, including power, low voltage, sensor control, fire alarm, intrusion alarm, telephone and instrumentation wiring
- B. Conduit Size: Comply with NFPA 70.
 - 1. Minimum Size: 3/4 inch for power and branch circuit wiring, unless noted otherwise on the drawings. Use 3/8" (min.) for flexible metal tubing for connection of indoor light fixtures.
 - 2. Minimum Size: 1 inch for low voltage, sensor control and instrumentation, unless noted otherwise on the drawings.
- C. Provide conduit in accordance with the following schedule:
 - 1. Outside primary and secondary service and feeder conduits below and above grade including primary service riser: Concrete encased galvanized or sherardized thick wall rigid steel (GRC).
 - 2. Conduit in earth (no encasement): Galvanized or sherardized thick wall rigid steel (GRC). Metallic conduit shall be coated with 3 coats of polyvinyl polyethylene or hot asphast application. See requirements for outer-coated PVC for galvanized conduit.
 - 3. In all poured building construction concrete, thick wall galvanized or sherardized thick wall rigid steel (GRC).
 - 4. In masonry walls: Galvanized or sherardized thick wall rigid steel (GRC).
 - 5. Above suspended ceilings: Galvanized electrical metallic tubing (EMT).
 - 6. In metal stud walls: Galvanized electrical metallic tubing (EMT).
 - 7. In exposed locations outdoors: Galvanized or sherardized thick wall rigid steel (GRC), or intermediate grade rigid steel (IMC). Exceptions are as follows: For all conduit above grade and attached to any part of the water treatment facility provide outer-coated PVC galvanized rigid thick wall conduit; this includes conduit attached to walkways.
 - 8. Conduit in earth (concrete encased): Galvanized or sherardized thick wall rigid steel (GRC).
 - 9. In exposed locations indoors within corrosive areas (solids handling building): outer coated PVC galvanized thick wall rigid steel (GRC).
 - 10. Signal wiring and data highway: Galvanized or sherardized thick wall rigid steel (GRC) in non-corrosive areas and outer-coated PVC galvanized thick wall rigid conduit (GRC) in corrosive areas. Maintain a minimum spacing of 6 inches between power and control wiring.

2-02 METAL CONDUIT

- A. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit. Do not use split sleeve fittings on GRC.
- B. Fittings for EMT: Insulated throat steel connectors and fittings; compression fitting for size 3/4" through 2", set-screw for sizes greater than 2".

2-03 PVC COATED METAL CONDUIT

- A. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.
- 2-04 FLEXIBLE METAL CONDUIT AND LIQUIDTIGHT FLEXIBLE METAL CONDUIT
- A. Description: Indoors: medium wall thickness flexible steel.
- B. Description: Outdoors: interlocked medium wall thickness steel construction with PVC jacket.
- D. Fittings: NEMA FB 1.

2-05 METAL WIREWAYS

- A. Material: Indoor Sheet metal, galvanized inside and outside, screw cover. Sized as required for wire fill.
- B. Material: Outdoor Stainless steel, gasketed screw cover. Sized as required for wire fill.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps and other fittings to match and mate with wires as required for complete system.
- D. Select features as required to provide a complete wiring system and to comply with NFPA 70.
- E. Covers: Screw-cover type with stainless steel screws.
- F. Finish: Manufacturer's standard enamel finish applied over properly treated galvanized surface for indoor applications. NEMA 4X for outdoor applications.

2-06 CONNECTORS

A. Provide galvanized or sherardized rigid conduit fittings for GRC. Provide outer-coated PVC conduit fittings for outer-coated PVC thick wall GRC. Provide bushed connectors with grounding lug on GRC on sizes 1-1/2" and larger. Provide Myers hubs where connections are exposed to weather.

PART 3 EXECUTION

3-01 EXAMINATION

- A. Verify routing and termination locations of conduit prior to rough-in.
- B. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3-02 INSTALLATION

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- E. Group related conduits; support using conduit rack. Construct rack using PVC coated steel channel; provide space on each for 25 percent additional conduits.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 16070.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- H. Do not attach conduit to ceiling support wires.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route exposed conduit parallel and perpendicular to walls.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- L. Route conduit in and under slab from point-to-point.
- M. Maintain adequate clearance between conduit and piping.
- N. Cut conduit square using saw or pipecutter; de-burr cut ends.
- O. Bring conduit to shoulder of fittings; fasten securely.
- P. Use conduit hubs with sealing lock-nuts to fasten conduit to cast boxes. Provide stainless steel Myers hubs to connect conduits entering tops or sides of all junction boxes, pullboxes, wiring gutters, etc., exposed to weather.
- Q. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size. Use long-radius bends. Make field bends on raceways in accordance with tables in NFPA 70, Article 346.
- R. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- S. Provide suitable fittings to accommodate expansion and deflection where conduit

- crosses control and expansion joints.
- T. Provide suitable pull string or 14 AWG steel wire in each empty conduit except sleeves and nipples.
- U. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- V. Ground and bond conduit under provisions of Section 16060.
- W. Identify conduit under provisions of Section 16075.
- X. Coat exposed male conduit threads with silicone sealer where conduit is installed outdoors or in contact with concrete or earth.
- Y. Install all feeders in galvanized or sherardized thick wall thick wall rigid steel conduit (GRC). For all conduit 1" and larger passing under roadways, use concrete encased GRC. Concrete encasement extends beneath the roadway to 5 feet outside of roadway shoulder.
- Z. Use PVC coated GRC thick wall conduit where conduit is attached to or above the water treatment basins, aerators, clarifiers, lift stations and other structures. Provide Type 302 stainless steel anchors for attaching or anchoring conduits to walkway structures; anchors must be approved by the Contracting OfficerAA. Provide conduits sized as noted on the drawings and/or indicated herein. Where size is not shown, consult the Contracting Officer.
- AB. Rigidly support upturned conduits during construction rough-in and attach flag/ribbon to stake or steel rod to aid other trades in recognizing the work.
- AC. Cap upturned conduits during construction rough-in to prevent moisture or debris from entering. Pull through each conduit a dry swab of sufficient size to remove moisture from conduits. Swab each conduit as many times as are required to remove moisture. Seal conduit terminations with silicone sealant or duct putty prior to final acceptance of the project.
- AD. Seal conduits terminations with silicone sealant or duct putty after conductors are installed and prior to final acceptance of the project.
- AE. Use 3/8" flexible metal tubing for final connections of indoor light fixtures; not to exceed 60 inches in length.
- AF. Use lengths of liquid-tight flexible conduit in lengths not exceeding 60 inches.
- AG. Assure ground continuity on all branch circuit rigid conduits by providing two locknuts, one inside and one outside, at all boxes, cabinets and gutters.
- AH. Identify conduit under provisions of Section 16075.

3-03 INTERFACE WITH OTHER PRODUCTS

A. Route conduit through manufactured roof openings or equipment curbs for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Division 7.

DIVISION 16 - ELECTRICAL

SECTION 16138

BOXES

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BOXES

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1-02 RELATED SECTIONS

- A. Section 16139 Cabinets and Enclosures.
- B. Section 16140 Wiring Devices: Wall plates in finished areas.

1-03 REFERENCES

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies; National Electrical Manufacturers Association; 1993.
- C. NEMA OS 1 Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 1996.
- D. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 1997.
- E. NFPA 70 National Electrical Code; National Fire Protection Association, 1999.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
 - 1. Sheet Metal Boxes
 - 2. Cast Boxes
 - 3. Outlet Boxes

1-05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Provide products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

PART 2-PRODUCTS

2-01 OUTLET BOXES

DACW66-03-B-0003

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 16140.

2-02 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 16139.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Fiberglass Handholes: Die molded glass fiber hand holes:
 - 1. Cable Entrance: Pre-cut cable entrance at center bottom of each side.
 - 2. Cover: Glass fiber reinforced polyester, weatherproof cover with nonskid finish.

PART 3 - EXECUTION

3-01 EXAMINATION

A. Verify locations of outlets in offices and work areas prior to rough-in.

3-02 INSTALLATION

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- C. Coordinate placement and installation of outlet boxes for process, hvac and plumbing equipment with submittals for the equipment and with the equipment installer.
- D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box locations up to 20 feet if required to accommodate intended purpose.
- F. Orient boxes to accommodate wiring devices orientation as specified in Section 16140.
- G. Maintain headroom, and present neat mechanical appearance.
- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches

- from ceiling access panel or from removable recessed luminaire.
- J. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 7.
- K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- N. In finished areas, use flush mounting wall outlet box, minimum size 4" x 4", with raised ring cover.
- O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening. Use raised gang square covers for boxes below 78" AFF, install box with bottom of box level with the lower edge of the brick or block; above 78" AFF install with top of box level with the top edge of the brick or block.
- P. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- Q. Secure flush mounting box to interior wall and partition studs. Accurately position boxes to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- T. Use adjustable steel channel fasteners for hung ceiling outlet box.
- U. Do not fasten boxes to ceiling support wires.
- V. Support boxes independently of conduit, except cast box that is connected to the rigid conduits both supported within 12 inches of box.
- W. Use gang box where more than one device is mounted together. Do not use sectional box.
- X. Use gang box with plaster ring for single device outlets.
- Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Z. Large Pull Boxes: Boxes greater than 100 cubic inches in volume, or 12 inches in any dimension.
- AA. Interior Dry Locations: Use hinged cover enclosure under provisions of Section 16139.
- AB. Other Locations: Use surface- mounted cast metal box.
- AC. Coordinate installation of outlet boxes and connection boxes for equipment provided under Division 15 and Section 13310.

DACW66-03-B-0003

3-03 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

3-04 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

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CABINETS AND ENCLOSURES

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks.
- D. Accessories.
- 1-02 RELATED SECTIONS
- A. Section 16070 Hangers and Supports.
- 1-03 REFERENCES
- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 1997.
- C. NEMA ICS 4 Industrial Control and Systems: Terminal Blocks; National Electrical Manufacturers Association; 1993 (Rev 1, 1997, Reapproved 2000).
- D. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.
- 1-04 SUBMITTALS
- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- 1-05 QUALITY ASSURANCE
- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- 1-06 MAINTENANCE MATERIALS
- A. Furnish four of each key.

PART 2 - PRODUCTS

- 2-01 HINGED COVER ENCLOSURES
- A. Construction: NEMA 250, Type 4X stainless steel enclosure.
- B. Covers: Continuous stainless steel hinge, held closed by three-point latch with Thandle.

- C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
- D. Enclosure Finish: brush finished stainless steel.
- 2-02 CABINETS
- A. Boxes: Galvanized steel.
- B. Backboard: Provide 3/4 inch thick plywood backboard for mounting terminal blocks. Paint matte white.
- C. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
- D. Provide metal barriers to form separate compartments wiring of different systems and voltages.
- E. Provide accessory feet for free-standing equipment.
- 2-03 ACCESSORIES
- A. Plastic Raceway: Plastic wiring channel with hinged or snap-on cover. Use for wiring channels in the cabinets for wire management
- 2-04 TERMINAL BLOCKS
- A. Terminal Blocks: NEMA ICS 4.
- B. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- C. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- D. Provide ground bus terminal block, with each connector bonded to enclosure.

PART 3 - EXECUTION

- 3-01 INSTALLATION
- A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 16070.
- C. Install cabinet fronts plumb.
- 3-02 CLEANING
- A. Clean electrical parts to remove conductive and harmful materials.
- B. Remove dirt and debris from enclosure.
- C. Clean finishes and touch up damage.

DIVISION 16 - ELECTRICAL

SECTION 16140

WIRING DEVICES

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3-06	ADJUSTING
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WIRING DEVICES

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Wall switches.
- B. Receptacles.
- C. Device plates and box covers.
- 1-02 RELATED SECTIONS
- A. Section 16138 Boxes.
- 1-03 REFERENCES
- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NEMA WD 1 General Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999.
- C. NEMA WD 6 Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 1997.
- D. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.
- E. Federal Spec WS-896 (switches) and WC-596F (receptacles)
- 1-04 SUBMITTALS
- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- 1-05 QUALITY ASSURANCE
- A. Conform to requirements of NFPA 70.
- B. Products: Provide products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

- 2-01 WALL SWITCHES
- A. Wall Switches: NEMA WD 1, Fed Spec WS-896, Heavy Duty, AC only general-use snap switch.
 - 1. Body and Handle: Brown plastic with toggle handle.
 - 2. Ratings:
 - a. Voltage: 120-277 volts, AC.
 - b. Current: 20 amperes.

- B. Switch Types: Single pole, double pole, and 3-way.
- C. Connections: back or side wired, secured beneath pressure plate by screw. Stab-in connections are not permitted.
- D. Attach ground wire to box such that the metal cover plate is grounded.

2-02 RECEPTACLES

- A. Receptacles: NEMA WD 1, Fed Spec WC-596F, Heavy duty.
 - 1. Device Body: Brown plastic.
 - 2. Configuration: NEMA WD 6, type as specified and indicated.
- B. Convenience Receptacles: Type 5-20.
- C. Single Convenience Receptacles: Type 5-20.
- D. Duplex Convenience Receptacles: Type 5-20.
- E. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements. Type 5-15. For personnel ground fault protection utilize 5 ma interrupters; for equipment ground fault protection use 30 ma interrupters.
- F. Connections: back or side wired, secured beneath pressure plate by screw. Stab-in connections are not permitted.
- G. Attach ground wire to box such that the metal cover plate is grounded.

2-03 WALL PLATES

- A. Decorative Cover Plates: Brush finished, Type 302 stainless steel.
- B. Jumbo Cover Plates: Brush finished, Type 302 stainless steel.
- C. Unfinished Areas: Galvanized steel, style to fit box application.
- D. Weatherproof Cover Plates: Gasketed cast metal with 'weather-resistant-while-in-use' cover plate.

PART 3 - EXECUTION

3-01 EXAMINATION

- A. Verify that outlet boxes are installed at proper height.
- B. Verify that wall openings are neatly cut (to within 1/16") and will be completely covered by wall plates.
- C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3-02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean construction debris from outlet boxes.

3-03 INSTALLATION

- A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install devices plumb and level.

- C. Install switches with OFF position down.
- D. Install receptacles with grounding pole on top.
- E. Connect wiring device grounding terminal to outlet box with bonding jumper.
- F. Connect wiring devices by inserting stripped conductor to full length and tightening screw on pressure plate.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- G. Use jumbo size plates for outlets installed in masonry walls.
- H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3-04 INTERFACE WITH OTHER PRODUCTS and MOUNTING HEIGHTS

- A. Coordinate locations of outlet boxes provided under Section 16138 to obtain mounting heights specified and indicated on drawings.
- B. Install wall switch 42 inches above finished floor.
- C. Install convenience receptacle 24 inches above finished floor.
- D. Install convenience receptacle 6 inches above backsplash of counter.
- E. Install telephone jack 24 inches above finished floor.
- 3-05 FIELD QUALITY CONTROL
- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized and properly polarized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.
- F. Replace or repair defective work.
- 3-06 ADJUSTING
- A. Adjust devices and wall plates to be flush and level.
- 3.06 CLEANING
- A. Clean exposed surfaces to remove splatters and restore finish.

DIVISION 16 - ELECTRICAL

SECTION 16155

EQUIPMENT WIRING

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EQUIPMENT WIRING

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. System of electrical power, instrumentation and control wiring for all equipment under other Divisions of the Specifications.

PART 2 - PRODUCTS

2-01 MATERIALS

A. Provide all materials of the type and quality specified in other Sections of the Specifications.

PART 3 - EXECUTION

3-01 WIRING OF OTHER DIVISIONS

- A. Make connections to equipment in accordance with manufacturer's instructions.
- B. Provide all power wiring, instrumentation wiring and control wiring and make all final connections including lugs for all equipment, unless specifically noted otherwise. Utilize materials and equipment as specified in other Sections of these Specifications.

3-02 SEPARATELY MOUNTED DEVICES

- A. Mount all separately mounted devices, furnished from other Divisions, that require only electrical connections for complete installation.
- B. Separately mounted devices that form an integral part of or require non-electrical system are mounted by the respective Division prior to power connection by Division 16.
- C. Provide safety switches, manual motor starters, toggle switches, etc., as required or indicated for the proper protection and disconnect means of all equipment furnished under other Divisions, where the equipment is not specifically furnished with disconnect means.

3-03 MOTORS

- A. Motor sizes indicated are approximate only and are subject to change to suit standard equipment construction of various manufacturers. Be responsible to check the electrical characteristics of motors specifically approved for installation and provide wiring and devices of proper sizes of these motors. Do not reduce any feeder or branch circuit conductor size or conduit size without prior written consent of the Contracting Officer.
- B. Check motor rotation and connect wiring for proper motor rotation.
- C. Where fusing is required, provide fusing in accordance with the types, sizes and characteristics of fuses contained in these Specifications.
- D. Confirm with equipment manufacturers prior to installing safety switches and provide fused protection in safety switches where fuses are required by the UL Listing of the equipment.

3-04 ROOF MOUNTED EQUIPMENT

A. Install conduits for roof mounted equipment inside the equipment curb. Roof penetrations are prohibited unless written approval is obtained from the Contracting Officer.

DIVISION 16 - ELECTRICAL

SECTION 16210

ELECTRICAL UTILITY SERVICE

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INSTALLATION

ELECTRICAL UTILITY SERVICES

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Service racks.
- B. Primary underground raceways.
- C. Transformer pad.
- 1-02 REFERENCES
- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.

1-03 SYSTEM DESCRIPTION

- A. Provision for Primary Cable: Provide conduits from the transformer pad location raceway to and up the riser pole.
- B. System Characteristics: 480Y/277 volts, three phase, four-wire, 60 Hertz.
- C. Service Entrance: underground feeder from pad-mounted transformer (with transformer provided by Entergy) to the Service Entrance equipment.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Submit utility company-prepared drawings.

1-05 QUALITY ASSURANCE

- A. Utility Company: Entergy MS, Inc.; 7411 Hwy. 51N; Southaven, MS 38671. Telephone: 662.280.6970 Contact: Robert Wilson
- B. Perform work in accordance with utility company written requirements and NFPA 70.
 - 1. Maintain two copies of each document on site.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1-06 PRE-INSTALLATION MEETING

A. Convene four weeks prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative.

PART 2 - PRODUCTS

2-01 Not Used

PART 3 - EXECUTION

3-01 PREPARATION

A. Arrange with utility company to obtain temporary construction power service and permanent electric service to the Project.

3-02 INSTALLATION

- A. Provide empty conduit(s) from utility company riser pole to the utility company transformer pad. Use GRC elbows at base of pole with GRC risers up the pole, to height as required by the utility company.
- B. Provide 1-1/4" empty conduit from the transformer secondary compartment to the meter base.
- C. Install meter base and provide mounting rack as required by utility company.
- D. Install equipment securely, in a neat and workmanlike manner, as specified in NECA 1.

DIVISION 16 - ELECTRICAL

SECTION 16231

PACKAGED ENGINE GENERATORS

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PACKAGED ENGINE GENERATORS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Packaged engine generator set.
- B. Exhaust silencer and fittings.
- C. Fuel tank.
- D. Remote control panel.
- E. Battery and charger.
- F. Weatherproof enclosure.

1-02 RELATED SECTIONS

A. Section 16413 - Automatic transfer switch.

1-03 REFERENCES

- A. NECA/EGSA 404 Recommended Practice for Installing Generator Sets; National Electrical Contractors Association; 2000.
- B. NEMA MG 1 Motors and Generators; National Electrical Manufacturers Association; 1998.
- C. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 1997.
- D. NFPA 70 National Electrical Code; National Fire Protection Association, 1999.
- E. NFPA 110 Standard for Emergency and Standby Power Systems; National Fire Protection Association; 2002.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.
- C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, and remote radiator.
- D. Test Reports: Provide report of performance testing.

- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Field Reports: Indicate procedures and findings.
- H. Operation Data: Include instructions for normal operation.
- I. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1-05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience with service facilities within 50 miles of Project.
- B. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum ten years documented experience.
- C. Products: Furnish products listed and classified by Underwriters Laboratories as suitable for purpose specified and indicated.

1-06 PRE-INSTALLATION MEETING

A. Convene meeting with equipment manufacturer's field representative one week before starting work of this section.

1-07 DELIVERY, STORAGE, AND HANDLING

- A. Accept unit on site on skids. Inspect for damage.
- B. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1-08 MAINTENANCE SERVICE

A. Furnish service and maintenance for engine-generator for one year from Date of Substantial Completion.

1-09 EXTRA MATERIALS

- A. See Section 00800, for additional provisions.
- B. Provide two of each fuel, oil and air filter element.

PART 2 - PRODUCTS

2-01 PACKAGED ENGINE GENERATOR SYSTEM

A. Description: NFPA 110, engine generator system to provide source of power for Level 1 applications conforming to NFPA 99.

B. System Capacity: 1750 kW, 2188 kVA at elevation of 300 feet above sea level, standby rating using engine-mounted radiator.

2-02 ENGINE

- A. Type: Water-cooled inline or V-type, four-stroke cycle, compression ignition Diesel internal combustion engine.
- B. Rating: Sufficient to operate under 10 percent overload for one hour in an ambient of 90 degrees F at elevation of 300 feet.
- C. Fuel System: No. 2 fuel oil.
- D. Engine speed: 1800 rpm.
- E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjusting.
- F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine over-crank. Limits as selected by manufacturer.
- G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.
- H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F, and suitable for operation on 208 volts AC.
- I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F. Radiator airflow restriction 0.5 inches of water maximum.
- J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gage, water temperature gage, and lube oil pressure gage on engine/generator control panel.
- K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2-03 GENERATOR

- A. Generator: NEMA MG 1, three phase, four pole, reconnectable brushless synchronous generator with brushless exciter.
- B. Rating: 1750 kW, 2188 kVA, at 0.8 power factor, 480Y/277 volts, 60 Hz at 1800 rpm.
- C. Insulation Class: F.
- D. Temperature Rise: 130 degrees C Standby.

- E. Enclosure: NEMA MG 1, open drip proof.
- F. Voltage Regulation: Include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Include manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.
- G. Lugs: Provide two hole compression connectors for terminating conductor sized larger than #4/0. Provide one hole compression connector for conductors size #6 through #4/0 AWG; see 16123 Building Wire and Cable: compression connectors.

2-04 ACCESSORIES

- A. Skid-Mounted Fuel Tank: 3000 gallon steel double wall tank, with fill and vent.
- B. Exhaust Silencer: Residential type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions. Provide thermostatically controlled battery heater pads, 120V.
- C. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 380 amperehours (2600 cold cranking amps) minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.
- D. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.
- E. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide wall-mounted enclosure to meet NEMA 250, Type 1 requirements. Battery charger is located with in the generator enclosure.
- F. Line Circuit Breaker: Molded case circuit breaker, 100 percent rated, on generator output with electronic trip, sized in accordance with NFPA 70; UL listed. Include battery-voltage operated shunt trip, connected to open circuit breaker on engine failure and integral ground-fault circuit sensor system to trip in case of ground fault on a load circuit. Unit mount in enclosure to meet NEMA 250, Type 1 inside the generator set outdoor enclosure requirements.
- G. Engine-Generator Control Panel: NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:
 - 1. Frequency Meter: 55-65 Hz. range, 3.5 inch dial.
 - 2. AC Output Voltmeter: 3.5 inch dial, 2 percent accuracy, with line selector switch. (7 position)
 - 3. AC Output Ammeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 - 4. Output voltage adjustment.
 - 5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, over-speed, and over-crank.
 - 6. Engine start/stop selector switch.
 - 7. Engine running time meter.
 - 8. Oil pressure gage.
 - 9. Water temperature gage.

- 10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
- 11. Additional visual indicators and alarms as required by NFPA 110.
- H. Remote Emergency Stop Switch: Surface mounted and prominently labeled. Pushbutton is protected from accidental operation. Provide break glass pushbutton type furnished with hammer mounting clip, hammer and chain all mounted on a common box with a large cover plate with engraved nameplate reading:
 - 1. Line 1: "Generator"
 - 2. Line 2: "Emergency Off"
- I Weather-Protective Enclosure: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Include fixed louvers, 3000-gallon fuel tank, battery rack, and silencer.
- J. Panelboard: Provide in gen-set enclosure, single phase, 120/208 volts, 60 amp main breaker, branch circuits to serve engine block heater(s), battery space heater and other accessories.
- K. Enclosure Interior Lighting: 24volts, vibration tolerant incandescent, minimum four lighting units. Provide a switch at each entry.
- L. Provide a 20 amp, GFCI recepticle in a weather-resistant while-in-use cover in enclosure. Circuit from panelboard at gen-set.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely, in a neat and workmanlike manner, as specified in NECA/EGSA 404.

3-02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01400.
- B. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal.
- C. Record in 20-minute intervals during four-hour test:
 - 1. Kilowatts.
 - 2. Amperes.
 - 3. Voltage.
 - 4. Coolant temperature.
 - 5. Room temperature.
 - 6. Frequency.
 - 7. Oil pressure.
- D. Test alarm and shutdown circuits by simulating conditions.

3-03 MANUFACTURER'S FIELD SERVICES

- A. Provide the services of manufacturer's representative to prepare and start system.
- B. Manufacturer's Engineer or technician checks engine wiring and fluid levels prior to starting the engine.
- 3-04 ADJUSTING
- A. Adjust generator output voltage and engine speed.
- 3-05 FUEL: Provide initial fuel tank of fuel. After field testing is completed, replace fuel consumed by testing.
- 3-06 FIELD TESTING
- A. Perform a six-hour long field test using resistive and reactive load bank to achieve p.f. of 70 percent to 100 percent. Apply load in 20 percent increments from 40 percent to 100 percent on 30 minute intervals with the following power factors:
 - 1. 40 pct. Load, p.f. = 1.0
 - 2. 60 pct. Load, p.f. = .90
 - 3. 80 pct. Load, p.f. = .80
 - 4. 100 pct. Load, p.f. = 1.0
 - 5. 100 pct. Load, p.f. = .80
 - 6. 100 pct. Load, p.f. = .75
 - 7. 100 pct. Load, p.f. = .70
 - 8. 80 pct. Load, p.f. = .70
 - 9. 60 pct. Load, p.f. = .75
 - 10. 40 pct. Load, p.f. = .80
 - 11. 40 pct. Load, p.f. = .75
 - 12. 100 pct. Load, p.f. = .80 (sudden increase of load application to check out put with sudden load change.)
- B. Compile the test results and document at 10 minutes intervals
 - 1. Output voltage each time load is switched with time required for recovery to rated output.
 - 2. Output kW and kVA.
 - 3. Frequency variation at time of load change and time required to reach steady-state.
 - 4. Engine temperature and oil pressure.
- C. Provide required load bank and cables for test load equipment.
- D. Provide fuel for generator set testing.

3-07 CLEANING

A. Clean engine and generator surfaces. Replace oil and fuel filters.

3-08 DEMONSTRATION

- A. Describe loads connected to standby system and restrictions for future load additions.
- B. Demonstrate routine examination of engine and generator system, fluid levels, including batteries.
- C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide standby power.

DIVISION 16 – ELECTRICAL

SECTION 16272

DRY TYPE TRANSFORMERS

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2-02	FIELD LOAD CENTERS
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3-02	FIELD QUALITY CONTROL
3-03	ADJUSTING

DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Two-winding, dry type transformers.

1-02 RELATED SECTIONS

- A. Section 16060 Grounding and Bonding.
- B. Section 16131 Conduit: Flexible conduit connections.

1-03 REFERENCES

- A. NEMA ST 20 Dry-Type Transformers for General Applications; National Electrical Manufacturers Association; 1992 (R1997).
- B. NFPA 70 National Electrical Code; National Fire Protection Association, 1999.

1-04 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures

1-05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1-06 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 - PRODUCTS

2-01 TWO-WINDING TRANSFORMERS

- A. Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated.
- B. Primary Voltage: 480 volts, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase, 4 wire.

- D. Insulation system and average winding temperature rise for rated Kva as follows:
 - 1. 1-15 Kva: Class 185 with 80 degrees C rise.
 - 2. 16-500 Kva: Class 220 with 80 degrees C rise.
- E. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.
- F. Winding Taps:
 - 1. Transformers Less than 15 Kva: Two 5 percent below rated voltage, full capacity taps on primary winding.
 - 2. Transformers 15 Kva and Larger: NEMA ST 20.
- G. Sound Levels: NEMA ST 20.
- H. Basic Impulse Level: 10 Kv.
- I. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- J. Coil Conductors: Copper wire continuous windings with brazed or welded terminations.
- K. Transformer enclosure: NEMA ST 20.
 - 1. Type 1.
 - 2. Ventilated.
- L. Isolate core and coil from enclosure using vibration-absorbing mounts.
- M. Manufacturer's Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.
- N. Users identification nameplate: Comply with Section 16075
- 2-02 FIELD LOAD CENTERS
- A. Combination single phase 480 volts input: 240/120 volts output dry-type transformer in combination with single phase 120/240 volts, 3 wire plus ground panelboard. Provide unventilated NEMA 4x S/S enclosure. Transformer ratings and circuit breaker requirements as scheduled.

PART 3 - EXECUTION

- 3-01 INSTALLATION
- A. Set transformers plumb and level.
- B. Use flexible conduit, under the provisions of Section 16131, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- C. Mount trapeze-mounted transformers as indicated.
- D. Provide grounding and bonding in accordance with Section 16060.
- 3-02 FIELD QUALITY CONTROL
- A. Perform field inspection, testing, and adjusting in accordance with Section 00800.
- 3-03 ADJUSTING
- A. Measure primary and secondary voltages and make appropriate tap adjustments.

DIVISION 16 - ELECTRICAL

SECTION 16411

ENCLOSED CIRCUIT BREAKERS

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ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Enclosed circuit breakers.
- 1-02 RELATED WORK
- A. Section 16070 Hangers and Supports.
- B. Section 16075 Electrical Identification: Engraved nameplates.
- C. Section 16123 Building Wire and Cable: compression connectors.
- 1-03 REFERENCES
- A. NFPA 70 National Electrical Code; National Fire Protection Association, 1999.
- 1-04 SUBMITTALS
- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide catalog sheets showing ratings, trip units, time current curves, dimensions, and enclosure details.
- 1-05 QUALITY ASSURANCE
- A. Conform to requirements of NFPA 70.
- B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

- 2-01 MOLDED CASE CIRCUIT BREAKERS
- A. Molded Case Circuit Breakers: Type AB, UL Listed, for the following service conditions:
 - 1. Trip: Common trip handle.
 - 2. Handle: Lockable in either position.
 - 3. Rating: Breakers serving HVAC equipment have HACR rating.
 - 4. Lugs: Mechanical lugs and power-distribution connectors for quantity, size and material of conductors connected.
 - 5. Shunt-trip: Provide where indicated.
 - 6. Short Circuit Rating: Unless otherwise noted, 10,000 amps RMS symmetrical for 120 VAC; 14,000 amps RMS symmetrical for 277 VAC.

2-02 ACCESSORIES

A. Enclosures: Provide NEMA 4X enclosures, stainless steel.

- B. Auxiliary Switch: 120 volts, AC.
- C. Handle Lock: Include provisions for padlocking.
- D. Provide grounding lug in each enclosure.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed circuit breakers plumb. Provide supports in accordance with Section 16070.
- C. Height: 5 feet unless otherwise noted, to operating handle.
- D. Provide engraved plastic nameplates under the provisions of Section 16075.
- 3-02 FIELD QUALITY CONTROL
- A. Perform field inspection and testing in accordance with Section 01400.
- B. Inspect each circuit breaker visually.
- C. Perform several mechanical ON-OFF operations on each circuit breaker.
- D. Verify circuit continuity on each pole in closed position.
- E. Determine that circuit breaker will trip on over-current condition, with tripping time to NEMA AB 1 requirements.
- F. Include description of testing and results in test report.

DIVISION 16 - ELECTRICAL

SECTION 16412

ENCLOSED SWITCHES

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FIELD QUALITY CONTROL

ENCLOSED SWITCHES

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Nonfusible switches.
- B. Fusible switches.
- 1-02 RELATED SECTIONS
- A. Section 16491 Fuses
- B. Section 16123 Building Wire and Cable: compression connectors
- 1-03 REFERENCES
- A. NEMA FU 1 Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 1986.
- B. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 1996.
- C. NFPA 70 National Electrical Code; National Fire Protection Association, 1999.
- 1-04 SUBMITTALS
- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide switch ratings and enclosure dimensions.
- 1-05 QUALITY ASSURANCE
- A. Conform to requirements of NFPA 70.
- B. Products: Provide products listed by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 COMPONENTS

- A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
 - 1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - 2. Handle lockable in OFF position.
 - 3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.
- B. Non-fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.

- 1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
- 2. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 4X stainless steel.
- D. Lugs: Mechanical lugs on switches 100 amps or less; compression connectors on switches 200 amps and larger.
- E. Auxiliary contacts: In all disconnect switches, provide a set of auxiliary contacts for the disconnection of control wiring or interlock wiring.
- F. Ground lug: Provide a lug in each switch for connection of ground wire in the branch circuit and the ground wire to the equipment.

PART 3 - EXECUTION

- 3-01 INSTALLATION
- A. Install in accordance with manufacturer's instructions.
- B. Install fuses in fusible disconnect switches.
- C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.
- D. Clean interiors of all switches of construction dirt and debris prior to closeout.
- 3-02 FIELD QUALITY CONTROL
- A. Perform field inspection in accordance with Section 00800.

DIVISION 16 - ELECTRICAL

SECTION 16413

AUTOMATIC TRANSFER SWITCH

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AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Automatic Transfer Switch.

1-02 RELATED SECTIONS

- A. Section 03300 Cast-in-Place Concrete: Housekeeping pads.
- B. Section 16075 Electrical Identification: Engraved nameplates.
- C. Section 16231 Packaged Engine Generator Set
- D. Section 16123 Building Wire and Cable: Compression lugs.

1-03 REFERENCES

- A. NEMA ICS 10 Industrial Control and Systems: AC Transfer Switch Equipment; National Electrical Manufacturers Association; 1999.
- B. Underwriters Laboratories Standard 1008.
- C. Underwrites Laboratories Standard 489.

1-04 SUBMITTALS

- A. Provide data to support compliance with the requirements of paragraph 1.05.
- B. Product Certificates: Signed by manufacturer's product manager certifying that the products furnished comply with U.L. requirements, NEMA standards and and Seismic Zone 4, and that prototypical switches have been tested for load ratings and short-circuit closing and withstand ratings applicable to unit for this Project.
- C. Product Data: Provide manufacturer's data on specified products describing product ratings and each item features in detail. Provide dimensioned plans, sections, equipment weight, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for switch. HIGHLIGHT or IDENTIFY each characteristic or feature of switch so that characteristics and features can be readily confirmed/checked against the specified characteristics. Clearly identify all exceptions and/or deviations from the technical specifications.
- D. Wiring Diagrams: Provide detailed wiring for transfer switch and differentiate between factory-installed and field-installed wiring. Show both power and control wiring.
- E. Single-line Diagram: Show connections between transfer switch, power sources and load.
- F. Field Test Reports: Indicate and interpret test and inspection results for compliance with performance requirements; prepare the tests and reports in association with the

- manufacturer's local representative.
- G. Maintenance Data: Provide for each type of product a list of all factory settings of relays and instructions for relay-setting and calibration, including software where applicable. Provide recommended testing procedures and schedule. Provide schedule and procedures for routine maintenance.
- H. See Section 00800, for submittal procedures.

1-05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Specialists regularly engaged in manufacture of UL Service Entrance rated automatic transfer switches of the type, rating and characteristics required whose products have been in satisfactory use in similar service for not less than ten years.
- B. Emergency Service Capability: Maintain a service center capable of emergency maintenance and repairs at the Project with a response time of eight hours or less.
- C. Labeling: U.L. listed as "Suitable for Use as Service Entrance Equipment" and U.L. listed under UL 1008.
- D. Service: Complies with NFPA 110, for Level 1 service.
- E. Comply with NFPA 70.
- F. Comply with UL 1008, unless the requirements of these Specifications are stricter.
- G. Comply with independent testing to meet or exceed requirements of Seismic Zone 4.

1-06 MAINTENANCE SERVICE

A. Provide service and maintenance of transfer switch, in accordance with manufacturer's recommended maintenance schedule (see para. 1.04.G), for one year from Date of Substantial Completion.

PART 2 - PRODUCTS

2-01 AUTOMATIC TRANSFER SWITCH

- A. Description: Transfer switch consists of mechanically interlocked switches, one for normal source and one for standby source.
 - 1. Switch for normal source: Electronic-trip insulated case power circuit breaker.
 - a. Device: Two-step stored energy type switch, UL listed for 100 percent continuous current. Sensor (frame) ampere rating as shown on the drawings.
 - b. Trip: Switch has adjustable instantaneous trip circuit. Circuit has a defeatable instantaneous adjustment to allow device to remain closed for up to 30 cycles during overcurrents below the rms symmetrical short time withstand rating. Tripping the normal source overcurrent switch does not initiate a start of the stand-by generator or a transfer to the standby source, to prevent closing the emergency source into a system fault condition. Switch trips instantaneously when current levels exceed applicable withstand ratings. Switch has six

- programmable features: long delay pickup, long time I²t response, short delay pickup, short delay time flat response, instantaneous, and ground fault delay flat response.
- c. Rating: Faceplate indicates rated ampacity, UL certification standards with applicable voltage systems and corresponding AIC ratings.
- d. Ground Fault Protection: Signal from ground fault system output trips switch on sensing ground fault; ground fault sensors are integral to the switch.
- e. Control Voltage: Is derived from within the transfer switch. All components, wiring, and connections are provided as a part of the switch during manufacture.
- 2. Switch for standby source: Electronic-trip encased power circuit breaker.
 - a. Device: Two-step stored energy type switch, UL listed for 100 percent continuous current. Frame ampere rating as shown on the drawings.
 - b. Trip: Switch has adjustable instantaneous trip circuit for short-circuit protection.
 - c. Rating: Faceplate indicates rated ampacity, UL certification standards with applicable voltage systems and corresponding AIC ratings.
 - d. Ground Fault Protection: Signal from ground fault system output trips switch on sensing a ground fault; ground fault sensors are integral to the switch.
 - e. Control Voltage: Is derived from within the transfer switch; see para. 2.02.A.1.e.
- B. Ground fault protection: Integral self-powered residual system ground fault protection with mechanical ground fault indicator, test function adjustable pick-up current and delay time with constant time characteristics, ground fault sensor c.t.s mounted on neutral bus of transfer switch or on main bus of Power Control Center. Sensor system has internal memory which integrates intermittent arcing ground faults. Set at the factory to the factory recommended settings.
- C. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer. Provide over-current protection in "NORMAL" and "STANDBY' sides. Provide electronic ground fault trip on both "NORMAL" and "STAND-BY" sources.
- D. Tested Fault-current Closing, Withstand and Interrupting Ratings: Provide switch rated 100,000 amperes, symmetrical, at 480 volts per latest UL1008 3-cycle standard and 51,000 amperes, symmetrical, at 480 volts per latest UL 1008 30-cycle standard for coordination with power breakers with short time trip units and with the type of overcurrent protection shown on the drawings.
- E. Configuration: Mechanically held and electrically operated transfer switch, operated by a stored energy mechanism. Switch is designed for continuous-duty repetitive transfer of full-rated current between active power sources when operated electrically or manually. Switch mechanism is mechanically interlocked to ensure only one of three possible positions Normal, Standby, or Neutral (during operation of load voltage decay sensing).
- F. Interface Components: Provide devices at transfer switch for communicating with

- remote annunciator.
- G. Microprocessor Controls: Repetitive accuracy of all settings is plus or minus 2 percent or better over an operating range of 0 degrees F to 105 degrees F, or greater.
- H. Resistance to Damage by Voltage Transients: Components meet or exceed voltagesurge withstand capability requirements when tested according to IEEE 62.41.
- I. Poles: Provide 4-pole switch having full-capacity neutral contacts with separate arcing contact of same size and design as the phase contacts.
- J. Contacts: Silver composition or silver alloy for load-current switching, with separate arcing contacts.
- K. Enclosure: Open-style or in NEMA 1 enclosure as required for shipping without damage Power Control Center manufacturer's factory for installation in the Power Control Center; reference Section 16480. Responsibility for dimensional compatibility in the Power Control Center lies with the Power Control Center manufacturer.
- L. Factory Wiring: Train and bundle factory wiring and label consistent with Shop Drawings, either by numbered or lettered wire markers at terminations.
 - 1. Cable terminals: Provide factory-installed two-hole solderless pressure lugs suitable for sizes of field wiring indicated on the line and standby source connection terminals. For connection to switch load terminals provide for bus connection to the main bus in the Power Control Center.
 - 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for bottom entrance of feeder conductors as required by installation conditions.
 - 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
 - 4. Wiring Harness: Provide between transfer switch and control panel with a built-in disconnect for routine maintenance.
- M. Lugs: Provide two hole compression lugs for all conductors sizes larger than #4/0 AWG and one hole lugs for conductor #4 through #4/0. See Section 16075.

2-02 COMPONENTS

- A. Control Module: Microprocessor based, including all sensing, time-delay relays and controls, mounted separately on the door of the Power Control Center, easily accessible for ease of maintenance.
 - 1. Sensing and Control Logic: Solid-state, microprocessor logic.
 - 2. Interfacing Relays: Industrial-control grade, plug-in type with dust covers and locking clips.
 - 3. Positive Contact: All moveable parts of the operating mechanism remain in positive contact with the main contacts during the transfer operation without the use of separate mechanical interlocks. Automatic operation of the switch does not require power from any source other than the line-to-line voltage of the source to which the switch is transferring.

4. Programmed transition/Load Voltage Decay: Factory wired, internal relay controls transfer between two live sources with a pause in the neutral position to prevent excessive in-rush currents or out-of-phase transfer. The delay runs until a preselected percentage of nominal voltage is achieved; field adjustable 10-30 percent. Factory set at 10 percent.

B. Accessory features include:

- 1. Lugs: Provide two-hole compression lugs on all input and output connections. See Section 16123. Use taller cabinet as required.
- 2. Under-voltage Sensing for Each Phase of Normal Source: Senses low line-to-line voltage on each phase. Pick-up voltage is adjustable from 85 to 100 percent of nominal, and drop-out voltage is adjustable from 75 to 98 percent of nominal. Factory set for pick-up at 90 percent and dropout at 85 percent.
- 3. Voltage/Frequency Lockout Relay: Prevents premature transfer to generator set. Pick-up voltage is adjustable from 85 to 100 percent of nominal. Factory set for pick up at 90 percent. Pick-up frequency is adjustable from 90 to 100 percent of nominal. Factory set for pick-up at 95 percent.
- 4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes; factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained under-voltage of emergency source, provided the normal supply has been restored.
- 5. Engine Start and Transfer Time Delay: Override momentary normal source dips and outages. Adjustable 0 to 6 seconds, factory set for 3 seconds.
- 6. Transfer time: Loads transfers and load is stabilized in 20 seconds.
- 7. Test Switch: Simulates normal source failure.
- 8. Switch Position LED Pilot Lights: Indicate source to which load is connected, green normal source; amber generator source.
- 9. Indicating LED Lights: Supervise sources via transfer switch, normal- and emergency-source sensing circuits and system conditions, with form C contacts as required for each indication.
 - a. Normal Power Supervision: Amber LED light with faceplate legend "NORMAL SOURCE AVAILABLE".
 - b. Emergency Power Supervision: Amber LED light with faceplate legend "EMERGENCY POWER AVAILABLE'.
 - c. Retransfer Override Mode: "MANUAL" message displays on logic status screen.

- 10. Unassigned Auxiliary Contacts: Two normal open single-pole, double-throw contacts for each switch position.
- 11. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to standby power source regardless of condition of normal source. Logic is selectable for automatically or manually initiated return to normal source. "MANUAL" message displays on logic status screen.
- 12. Engine Starting Contacts: One set of isolated engine starting contracts as required by generator set manufacturer's starting circuit design for automatic remote generator set starting.
- 13. Engine Shutdown: Time delay adjustable from 0 to 10 minutes; factory set for 5 minutes. Initiates shutdown at the engine-generator control panel after retransfer of load to normal source, for engine cool-down.
- 14. Engine-Generator Exerciser: Provide an exerciser program in the transfer switch logic. Solid-state programmable time-switch starts engine-generator set and shuts down engine after preset cool-down period as specified in paragraph above. Initiates exercise cycle at preset intervals adjustable up to 7 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exercise features include the following:
 - a. Exerciser Transfer Selection: Logic allows selection of exercise with and without load transfer.
 - b. Pushbutton programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is not available.
- 15. Non-commit to Transfer to Generator: ATS controls eliminate unnecessary interruptions to the load by not committing transfer to emergency source in the event the normal source returns prior to the emergency source achieving proper operating voltage and frequency.
- 16. Enclosure: NEMA 1 gasketed with urethane gaskets. The NEMA 1 encolsure is housed outdoors with the TVSS equipment, in a separate NEMA 4X stainless steel housing,

2-03 REMOTE STATUS AND ANNUNCIATOR PANEL

A. Description: Provide an annunciator panel to display the status of controls and indicating lights of the transfer switch, to include the following functions for the transfer switch:

- 1. Indication of sources available, as defined by actual pickup and dropout settings of transfer switch controls.
- 2. Indication of switch position.
- 3. Indication of switch in test mode.
- 4. Indication of status of digital communications link.
- B. Malfunction of the annunciation and control panel or communication link does not affect the functions of automatic transfer switch. In the event of failure of the communications link, automatically reverts to stand-alone, self-contained operation. Automatic transfer switch sensing, controlling, or operating function does not depend on remote panel for proper operation.
- C. Remote Annunciation Panel: Solid-state components. Include the following features:
 - 1. Video screen presentation programmed for touch-screen or similar mode of controls and displaying indicating light status.
 - 2. Digital Communications Capability: Matched to the transfer switch supervised.

2-04 SOURCE QUALITY CONTROL

A. Factory Test Components, Assembled Switches, and Associated Equipment: Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Control and Annunciator Panel Mounting: Flush in front exterior door of Power Control Center, with lockable hinged covers.
- B. Provide engraved plastic nameplates in accordance with Section 16075.
- C. Adjustment: Adjust all operating mechanisms and moving parts for free mechanical movement.

3-02 WIRING TO REMOTE COMPONENTS

- A. Match type and number of cables and conductors to control and communications requirements of transfer switch as recommended by manufacturer. Increase raceway sizes at no additional cost if necessary to accommodate required wiring.
- B. Provide all wiring between transfer switch and engine generator set.
- C. Install remote annunciator panel for transfer switch and engine generators set as directed by the Contracting Officer.

3-03 CONNECTIONS

- A. Checking: Check connectors, terminals, bus joints and mountings for tightness. Tighten field-installed connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque-tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torque specified in UL 486A.
- B. Ground equipment as required by NFPA 70.

3-04 FIELD QUALITY CONTROL

- A. Provide the services of the manufacturer's technical representative to check out transfer switch connections and operations and place in service. Coordinate the ground fault setting of the switch for standby source with the ground fault setting of the generator output breaker. Set ATS-GF at lower level than generator output breaker.
- B. Field Tests: Give ten-day advance notice of the tests, in writing, and perform tests in presence of the Contracting Officer.
- C. Testing: Perform the following field quality-control testing under the supervision of the manufacturer's factory-authorized service representative in addition to tests recommended by the manufacturer:
 - 1. Before energizing equipment, after transfer switch products have been installed:
 - Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits.
 Use test voltages and procedure recommended by manufacturer. Meet manufacturer's specified minimum resistance.
 - b. Check for electrical continuity of circuits and for short circuits.
 - c. Inspect for physical damage; proper installation and connection; and integrity of barriers, covers and safety features.
 - d. Verify that manual transfer warnings are placed properly.
 - e. Perform manual transfer operation.
 - 2. After energizing circuits, demonstrate interlocking sequence and operational function for switch at least three times.
 - a. Simulate power failures of: 1) normal source to automatic transfer switch and 2) emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pick-up and dropout voltages by data readout or inspection of control settings.
 - e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown sequence.
 - 2. Correct deficiencies and retest.
- D. Coordinate tests with tests of generator plant and run them concurrently.

E. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistance and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests. Include all test results in the Operations and Maintenance Manual.

3-05 CLEANING

A. Clean equipment internally, on completion of installation, according to manufacturer's written instructions. Vacuum clean interior of transfer switch of construction dust and debris.

3-06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train personnel how to adjust, operate, and maintain transfer switch and related equipment as specified below:
 - 1. Coordinate this training with that for generator equipment.
 - 2. Demonstrate operation of transfer switch in, normal, and emergency modes.
 - 3. Train maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment.
 - 4. Review data in maintenance manuals.
 - 5. Schedule training with Contracting Officer, with at least seven days advance notice.
 - 6. Provide a minimum of four hours of instruction.

DIVISION 16 - ELECTRICAL

SECTION 16423

ENCLOSED MOTOR CONTROLLERS

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ENCLOSED MOTOR CONTROLLERS

PART 1 - GENERAL

- 1-01 SECTION INCLUDES
- A. Manual motor controllers.
- B. Magnetic motor controllers.
- C. Combination magnetic motor controllers and disconnects.
- 1-02 RELATED SECTIONS
- A. Section 16070 Hangers and Supports.
- B. Section 16075 Electrical Identification: Engraved nameplates.
- 1-03 REFERENCES
- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NEMA ICS 2 Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 1993.
- C. NEMA ICS 5 Industrial Control and Systems: Control Circuit and Pilot Devices; National Electrical Manufacturers Association; 1993 (Rev 1, 1996).
- D. NEMA ICS 6 Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association; 1993.
- E. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 1996.
- F. NFPA 70 National Electrical Code; National Fire Protection Association, 1999.
- 1-04 SUBMITTALS
- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- 1-05 QUALITY ASSURANCE
- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

- 2-01 MANUAL CONTROLLERS
- A. Manual Motor Controllers: NEMA ICS 2, AC general-purpose, Class A, manually

- operated, full-voltage controller with overload element, red pilot light, NO auxiliary contact, and push button operator.
- B. Enclosures: NEMA ICS 6, Type 4X.
- 2-02 AUTOMATIC CONTROLLERS
- A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
- B. Two-Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.
- C. Coil Operating Voltage: 120 volts, 60 Hertz.
- D. Overload Relays: NEMA ICS 2; bimetal.
- E. Enclosures: NEMA ICS 6, Type 4X.
- 2-03 ACCESSORIES
- A. Auxiliary Contacts: NEMA ICS 2, 2 field convertible contacts in addition to seal-in contact.
- B. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oiltight type.
- C. Pushbuttons: Unguarded type.
- D. Indicating Lights: Transformer, LED type.
- E. Selector Switches: Rotary type.
- F. Control Power Transformers: 120 volt secondary, 25 va, minimum, greater than contactor operating requirements in each motor starter. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

2-04 DISCONNECTS

A. Motor Circuit Protector: Circuit breakers with integral instantaneous magnetic trip in each pole; UL listed.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.
- B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- C. Provide supports in accordance with Section 16070.
- D. Height: 5 ft to operating handle.
- E. Select and install overload heater elements in motor controllers to match installed motor characteristics.

- F. Provide engraved plastic nameplates; refer to Section 16075 for product requirements and location.
- G. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.
- 3-02 FIELD QUALITY CONTROL
- A. Perform field inspection and testing in accordance with Section 00800.

DIVISION 16 – ELECTRICAL

SECTION 16426

ENCLOSED CONTACTORS

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ENCLOSED CONTACTORS

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. General purpose contactors.
- B. Lighting contactors.

1-02 RELATED SECTIONS

- A. Section 16070 Hangers and Supports.
- B. Section 16075 Electrical Identification: Engraved nameplates.

1-03 REFERENCES

- A. NEMA ICS 2 Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 1993.
- B. NEMA ICS 5 Industrial Control and Systems: Control Circuit and Pilot Devices; National Electrical Manufacturers Association; 1993 (Rev 1, 1996).
- C. NEMA ICS 6 Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association; 1993.
- D. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 1996.
- E. NFPA 70 National Electrical Code; National Fire Protection Association, 1999.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide dimensions, size, voltage ratings and current ratings.

1-05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2-01 GENERAL PURPOSE CONTACTORS

- A. Description: NEMA ICS 2, AC general purpose magnetic contactor.
- B. Coil operating voltage: 120 volts, 60 Hertz.
- C. Poles: As required to match circuit configuration and control function.
- D. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.
- E. Enclosure: NEMA ICS 6, Type 1 as required to meet conditions of installation.
- F. Accessories:
 - 1. Selector Switch: ON/OFF/AUTOMATIC.

2-02 LIGHTING CONTACTORS

- A. Description: NEMA ICS 2, magnetic lighting contactor, with sub-panel having clearing contacts, for two wire control.
- B. Configuration: Mechanically held, 2 wire control.
- C. Coil operating voltage: 120 volts, 60 Hertz.
- D. Poles: As required to match circuit configuration and control function.
- E. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.
- F. Enclosure: NEMA ICS 6, Type 1, or as required to meet conditions of installation...
- G. Accessories:
 - 1. Selector Switch: ON/OFF/AUTOMATIC.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install enclosed contactors where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed contactors plumb. Provide supports in accordance with Section 16070.
- C. Height: 5 ft to operating handle.
- D. Provide engraved plastic nameplates; refer to Section 16075 for product requirements and location.

3-02 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 00800.

DIVISION 16 – ELECTRICAL

SECTION 16443

PANELBOARDS

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PANELBOARDS

PART 1 - GENERAL

1-01 SECTION INCLUDES

A. Lighting and appliance panelboards.

1-02 RELATED SECTIONS

- A. Section 16060 Grounding and Bonding.
- B. Section 16075 Electrical Identification.

1-03 REFERENCES

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NEMA PB 1 Panelboards; National Electrical Manufacturers Association; 1995.
- C. NEMA PB 1.1 General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 1996.
- D. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1-05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2-01 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Circuit breaker type, lighting and appliance branch circuit panelboard.

- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Minimum Integrated Short Circuit Rating:
 - 1. 240 Volt Panelboards: 10,000 amperes rms symmetrical.
 - 2. 480 Volt Panelboards: 14,000 amperes rms symmetrical.
- D. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
 - 1. Type SWD for lighting circuits.
 - 2. Type HACR for air conditioning equipment circuits.
 - 3. Class A ground fault interrupter circuit breakers where scheduled.
 - 4. Do not use tandem circuit breakers.
- D. Enclosure: NEMA 1 installed in the Power Control Center; see Section 16480.
- E. Identification Nameplates: Comply with Section 16075.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Provide engraved plastic nameplates under the provisions of Section 16075.
- G. Ground and bond panelboard enclosure according to Section 16060.

3-02 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 00800.

3-03 ADJUSTING

A. Panel bus loading to balance phase loading is a basic part of the system design. Measure steady state load currents at each panelboard feeder; consult the Contracting Officer before rearranging circuits in the panelboard, Phase loads should balance within 10 percent of each other. Rearranging breakers may result in improper phasing for multi-wire branch circuits and incorrect wire identity numbers and conductor color coding.

DIVISION 16 – ELECTRICAL

SECTION 16480

POWER CONTROL CENTER

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- PRODUCTS
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3-01 INSTALLATION

3-02 ENGINEERING SUPERVISION

POWER CONTROL CENTER

PART 1 - GENERAL

1-01 DESCRIPTION

Provide Power Control Center that complies with the requirements of this Section. The Power Control Center accepts the incoming utility power and distributes the power throughout the facility; it contains the feeder circuit breakers, motor controls section, and PLC control section with metering and monitoring equipment for facility operation. The Power Control Center (ref. Section 13310) is the product of a provider with whom rests single-source responsibility for the Center.

1-02 RELATED SECTIONS

- A. Section 03300 Cast-in-Place Concrete: Housekeeping pads.
- B. Section 16075 Electrical Identification: Engraved nameplates.
- C. Section 16123 Building Wire and Cable: Compression Connectors.
- D. Section 16443 Panelboards

1-03 REFERENCES

- A. NECA (INST) NECA Standard of Installation; National Electrical Contractors Association; 1993
- B. NEMA AB 1
- C. NEMA ICS 2
- D. NEMA ICS 2.3
- E. NEMA ICS 5
- F. NEMA ICS 6
- G. NEMA PB 1
- H. NEMA PB 1.1
- I. NFPA 70

1-04 SUBMITTALS

- A. Submit shop drawings and product data, in accordance Section 01330 Submittal Procedures.
- B. Product Data: Provide catalog data of the various equipment installed in the Power Control Center, to include general specification information covering lugs for the scheduled size of incoming cables; ratings for voltage, bus ampere ratings (including neutral and ground buses), short circuit ratings, over-current protective devices; motor controller sizes, ratings, terminal blocks, control power transformers and accessories; TVSS, NEMA class and type wiring, over all unit dimensions; and enclosure details.
- C. In the preparation of submittal data for the Power Control Center use submittal data and installation data for the instrumentation and equipment "approved for use" on the

project. Obtain data for the instrumentation and equipment from the system supplier and coordinate characteristics of measuring and transmitting devices with the equipment used in the controls section. This coordination must be completed before preparing submittal on the Power Control Center. Submittals prepareded without this data will be returned by the Contracting Officer with no action taken.

D. Shop Drawings: Provide:

- 1. Complete list of all motors served on the project, coordinated with the finally selected equipment horsepower requirements.
- 2. One-line power diagram of the Power Control Center indicating:
 - a. Main busing with materials and ratings indicated
 - b. Frame and trip rating of feeder/branch circuit over-current protective devices.
 - c. Panelboard
 - d. Motor control units, type, size, motor protector rating.
 - e. Dry-type transformer for serving the panelboard.
 - f. Motor control centers and control panels located remotely from the Power Control Center, complete with data indicating horsepower of motors served and identification of remote equipment.
- 3. Physical layout of Power Control Center, completely labeled and dimensioned.
- 4. Motor control section data sheet indicating for each motor:
 - a. Motor tag name/number (as identified in the project).
 - b. Horsepower, voltage, phase and full load amps of motor.
 - c. Location (section and module) of controller in MCC section.
 - d. Over-current protective device frame, trip and interrupting ratings.
 - e. Controller type (FVNR, A-T, etc.), NEMA size rating and recommended overload element ratings.
 - f. Controller accessories and ratings, i.e., control power transformer, oil-tight rotary manual-off-automatic selector switch, oil-tight RUN lights, auxiliary contacts.
- 5. Power and control diagrams:
 - a. for each controller module indicating wire number colors, and identifying what the wires connect to, whether terminal block number and post number, PLC identity, etc. Do NOT submit "manufacturer's standardized module" drawings with common wire identification; each drawing must identify the wire identification that will be found in the finally constructed Power Control Center.
 - b. Diagrams depict required inter-unit connection data.
- 6. Prepare approval drawings per J.I.C. standards. Submit to Contracting Officer for review prior to any fabrication of controls equipment.

1-05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products of the complexity and quality specified in this section with minimum ten years documented experience and with service facilities within 250 miles of the Project. Manufacturer maintains service department and parts department capable of providing service within

- eight hours of notification, 24 hours a day, 365 days a year. Suppliers employing outside organizations for "ON CALL" service are not acceptable.
- C. Products: Listed and classified by Underwriters Laboratories, Inc., for the completed assembly.

1-06 DELIVERY, STORAGE AND HANDLING

- A. Deliver in vertical sections of 60 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with NEMA ICS 2.3. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to Power Control Center components, enclosure and finish.
- D. If unit is delivered to site prior to the building being closed in and dry, provide electric heaters within the Power Control Center sections (minimum, 300 watts per section) with the sections remaining tented or in the protective cover to prevent condensation in the Power Control Center.

1-07 WARRANTY

A. Provide warranty for equipment and installation in accordance with the Requirements of Division 1.

PART 2 - PRODUCTS

2-01 DESCRIPTION

- A. Contents: The Power Control Center houses
 - 1. Power monitor system
 - 2. Feeder circuit breakers
 - 3. Lighting panelboard
 - 4. Combination motor controllers
 - 5. PLC cabinets
 - 6. Controls expansion cabinet.
- B. Construction: Constructed with NEMA Class I switchboard structure (housing the feeder circuit breakers) close coupled to the structure containing combination motor controllers, the PLC cabinets and expansion cabinet. The switchboard structure complies with NEMA PB-1. The structure containing the motor controllers is constructed in compliance with NEMA ICS-2 motor control center of Class II construction with Type B wiring.

- C. Voltage Rating: 480/277 volts, three phase, four wire, 60 Hertz.
- D. Integrated Equipment Short Circuit Rating: 50,000 amperes RMS symmetrical at 480 volts.
- E. Power Monitor System: Provide electronic solid state power monitor on main bus between the main breaker and the branch feeder breakers. Power monitor includes current transformers and potential transformers required for measurement of phase:phase and phase:neutral voltages, measurement of phase amps on each phase, load kW, load kVA, power factor, peak demand kW, peak demand kVA, and kWH meter with reset. Current transformers have mounting brackets and brass stud terminals. Power monitor has LCD or LED alphanumeric display and maintains history of last 100 events. Meters provide two percent accuracy.
- F. Main Horizontal Bus: Tin-plated copper (98 percent conductivity) with silver-plated contact surfaces, with continuous current rating as indicated on the drawings, based on a current density of 1000 amps per square inch of cross-sectional area. Include copper neutral bus rated for 100 percent of the main bus rating in the switchboard sections and a copper ground bus entire length of switchboard and motor control center sections.
- G. Vertical Bus In Switchboard Section: Tin-plated copper (98 percent conductivity) with silver-plated contact surfaces, with current rating equal to 80 percent of the sum of the frame sizes of breakers installed in the section; bus current density of 1000 amps per square inch of cross-sectional area.
- H. Vertical Bus In Motor Control Center Section: Tin-plated copper with silver-plated contact surfaces, with current rating of 300 amperes (minimum) or equal to 80 percent of the sum of the frame sizes installed in the section. Bottom of vertical busing terminates at least 12 inches above the bottom of the housing so allow ample space for conduit entries and space for bending of cables. Busing in Motor Control sections has shuttered openings for the stabs on the motor control modules to plug onto the bus; shutters close when control module is withdrawn from the compartment.
- I. Configuration: Service Entrance section front and side accessible. Other sections accessible from the front only.
- J. Enclosure: NEMA ICS 6, Type 12, sealed with polyurethane gasket.
- K. Finish: Manufacturer's standard gray enamel.
- L. Structure: Formed steel vertical sections bolted together to form a rigid free-standing assembly. Vertical sections separated with steel barriers; distribution (vertical) buses, panelboard and motor control section vertical buses separated from the main horizontal bus by rigid insulating material. Support busing on non-tracking insulators. Sections are approximately 90 inches high and 24 inches deep, with width varying dependent on equipment installed therein. Provide vertical wiring gutter on each side of each of distribution sections for feeder and branch circuit wiring. Provide a vertical wiring gutter on the right side of each motor controls section for branch circuit wiring. Provide barriered horizontal wiring gutters at the top and bottom of all sections for

routing control wiring through to the PLC sections. Top, side and rear steel enclosure panels are secured in place with removable screws; riveted panels are not acceptable.

- M. Wiring: Control wiring within the switchboard sections uses wiring UL Listed for the purpose. Control wiring within the motor control sections uses wiring UL Listed for that purpose. Control wiring in motor controller modules is wired to pull-apart terminal blocks within the modules for easy module removal. Install terminal blocks are situated or angled to provide ready access for wiring. Wiring is color coded and marked alpha-numerically at each end using adhesive wire markers. Wires having different functions within the Center have different marks. Submit wiring diagram for each module, identifying the control and power wires and terminals; submit elevation-type drawing of each control module indicating the location and wire identity for each conductor termination.
- N. Feeder Breakers: Breakers rated less than 800 amps are 80 percent rated molded-case thermal-magnetic circuit breakers. Breakers rated 800 amps and larger are 100 percent rated molded-case circuit breakers.
- O. Combination Motor Controllers: Motor circuit protectors (magnetic only) with motor controller of the type indicated on the Drawings. Each motor controller is provided with thermal compensated thermal overload relay; each controller has three overload elements, sized in accordance with the actual motor nameplate amperes. Overload relay has alarm contact. Each controller has an individual 480:120 volts control power transformer; control power transformer is sized for 25 va plus the va requirement for normal operation. Controller has additional two normally open and two normally closed auxiliary contacts for interlocks. Module housing the combination motor controller is sized sufficiently large to house the motor monitor current transformer. The motor monitor c.t. connects to input modules in the PLC cabinet. Motor controller has oil-tight rotary Hand-Off-Auto selector switch and oil-tight red LED light indicating when "ON".
- P. Lighting Panel: Switchboard has lighting panels flush-mounted in two sections installed in the motor control center sections; see Section 16443 and Panelboard Schedule on the Drawings.
- Q. Power Transformer; A dry-type transformer is installed in one of the motor control sections.
- R. Transient Voltage Suppression System (TVSS): The TVSS is mounted in the enclosure for the service entrance automatic transfer switch (ATS) enclosure. The TVSS is connected to the main bus in the Switchboard with conductors of size and of no greater length than indicated in the TVSS manufacturer's installation instructions.
 - 1. TVSS provides transient voltage surge suppression and electrical high frequency noise filtering, in accordance with. Unit is designed for parallel connection to the switchboard system. TVSS unit uses selenium cells and metal oxide varistors to achieve its performance. Products using gas tubes, spark gaps, silicon avalanche diodes or other components which under failed conditions would cause system failure.
 - 2. Manufacturer qualifications: The product of a manufacturer engaged in the commercial design and manufacture of the type of product described herein for a minimum five years.

- 3. Standards: Product complies with the requirements of the following:
 - a. ANSI/IEEE C62.41-1991.
 - b. ANSI/IEEE C62.1 and C62.11.
 - c. UL 489 and UL 198.
 - d. UL 1449 (Listed as a transient voltage surge suppressor).
 - e. UL 1283 (Listed as an electromagnetic interference filter).
 - f. NEMA LS 1-1992 (maximum continuous operating voltage).
- 4. Operating Voltage: 480/277 volts, 3 phase, 4 wire + ground.
- 5. Maximum Continuous Operating Voltage (MCOV): greater than 115 percent of nominal voltage for all products. All suppression filter systems comply with NEMA LS 1-1992.
- 6. Frequency: Operating frequency range of 47 63 Hertz.
- 7. Protection Modes: all phases phase to ground; all phases phase to neutral; all phases phase to phase; and neutral to ground.
- 8. Rated Single Pulse Surge Current Capacity: at rated voltage, no less than:

250,000 A Line to Neutral

225,000 A Line to Ground

225,000 A Line to Line

225,000 A Neutral to Ground

- 9. Tested Single Pulse Surge Current Capacity: Filter system is designed to withstand a single pulse surge current up to 150 percent of the design rating and tested at an independent test laboratory. In the absence of testing facilities capable of such testing, testing of individual components or sub-assemblies within a mode is accepted by ANSI C62.41-1991; the testing includes a Category C1 surge test followed by a second Category C1 test. The test results demonstrate the unit does not degrade by more than 10 percent from the initial test.
- 10. Clamping Voltage: Suppression filter system clamping voltages are in compliance NEMA LS 1-1992. Maximum clamping voltages for 277/480 volts unit with integral fused disconnect are:

Mode	B3/C1 Comb. Wave
L - L	800
L - N	780
N - G	775
L - G	1500

11. High Frequency Filter: EMI-RFI noise rejection or attenuation values comply with test and evaluation procedures of NEMA LS 1-1992.

Attenuation Frequency	100kHZ	1MHz	10MHz	100MHz
Insertion loss (ratio)	50:1	350:1	500:1	250:1
Insertion loss (dB)	34	51	54	48

12. Suppression Filter System: minimum noise attenuation values are:

Attenuation Frequency	100kHZ	1MHz 10MHz	100MHz
Insertion loss (ratio)	355:1	50K:1 500K:1	1000K:1
Insertion loss (dB)	51	94 114	120

13. Life Cycle Testing: Each TVSS unit is capable of surviving at least 15,000 sequential Category surges (service entrance) without failing of degrading the

- UL 1449 surge suppression rating more than ten percent. Provide testing results from a NRTL certifying the testing results.
- 14. Enclosure: TVSS is enclosed in a gasketed NEMA 1 enclosure attached to the side of the "SE-ATS" cabinet, inside the NEMA 4X enclosure.
- 15. Overcurrent Protection: Unit includes coordinated UL 489 or UL 198 listed or recognized overcurrent protection devices; if fuses are used unit incorporates non-encapsulated, field replaceable fuses.
- 16. Documentation: Provide product data including equipment manual; electrical and mechanical drawings indicated dimensions weights, mounting provisions, connection details and layout diagram; certified tests of UL1449 Listing/Clamp Voltages and NEMA LS 1 compliance; certified single pulse surge current capacity testing; minimum repetitive surge current capacity testing; list of customer-replaceable spare parts; and diagnostic signature card for the unit shipped for installation.
- 17. Status Indicators: Unit has long-life, solid state, externally visible status indicators that monitor the on-line status of each phase of the unit.

2-02 COMPONENTS

- A. Current transformers: UL 1244, with minimum accuracy of 2 percent at 60 Hertz. 600 volts; 10 kV BIL.
- B. Control relays: Polycarbonate enclosed plug-in type. Coil winding is polyurethane insulated with insulation resistance of 100 megohms minimum. Mechanical life expectancy greater than 20 million operations. Typical pull-in speed of 14 milliseconds with typical drop-out speed of 10 milliseconds.
- C. Motor Monitor: Provide an electronic solid state Motor Monitor powered by 120 VAC, that will accept a 0-5 ampere input signal, condition the signal to perform ON/OFF or OPEN/CLOSE discrete dry type set-point contact conditions, based on the input signal value. Motor Monitor has the following features:
 - 13. Provide LCD readout meter providing field adjustable scales of 0-25, 0-50, 0-100, 0-250, 0-500 and 0-1000 to indicate accurately the motor full load current using the 0-5 amp input signal.
 - 14. Capable of displaying motor total running time up to 99,999.9 hours and be provided with reset capability from the rear of the monitor and complete with rechargeable battery backup for 12-hours and automatic battery charger.
 - 15. Provide two separate field adjustable set-points, each with discrete, isolated sealed SPDT relay output contacts. Setting of each set-point is adjustable throughout the complete signal range from the front of the monitor.
 - 16. An LED indicator is provided for each set-point to indicate when it is activated. Each set-point is provided with a field adjustable "ON" and "OFF" time delay and is adjustable from 0-15 seconds in one second increments. The actual setting of each set-point can be displayed on the LCD readout at any time.

Tag Service Scale

MM-1	Screw Pump No. 1 Motor Monitor	0-25 amps
MM-2	Screw Pump No. 2 Motor Monitor	0-25 amps
MM-3	Screw Pump No. 3 Motor Monitor	0-25 amps
MM-4	Screw Pump No. 1 Oiler Motor Monitor	0-5 amps
MM-5	Screw Pump No. 2 Oiler Motor Monitor	0-5 amps
MM-6	Screw Pump No. 3 Oiler Motor Monitor	0-5 amps
MM-7	Aerator No. 1 Motor Monitor	0-50 amps
MM-8	Aerator No. 2 Motor Monitor	0-50 amps
MM-9	Aerator No. 3 Motor Monitor	0-50 amps
MM-10	Aerator No. 4 Motor Monitor	0-50 amps
MM-11	Aerator No. 5 Motor Monitor	0-100 amps
MM-12	Aerator No. 6 Motor Monitor	0-100 amps
MM-13	Aerator No. 7 Motor Monitor	0-100 amps
MM-14	Aerator No. 8 Motor Monitor	0-100 amps
MM-15	Aerator No. 9 Motor Monitor	0-100 amps
MM-16	Aerator No. 10 Motor Monitor	0-100 amps
MM-17	Clarifier No. 1 Motor Monitor	0-5 amps
MM-18	Clarifier No. 2 Motor Monitor	0-5 amps
MM-19		
MM-20		

- D. Simplex Motor Controller: Provide a simplex motor controller including the following features:
 - 1. Manual-Off-Automatic selector switch, green "Motor Running" pilot light, red "Motor Failure" pilot light, red "High/Low" pilot light (for level, current, etc.) and, if required, a red "Seal Failure" pilot light.
 - 2. Motor control inputs are optically isolated and their power is limited to 24 VDC with a maximum current of 16 ma DC for intrinsic safety.
 - 3. Provide a field adjustable time delay relay to delay in allowing the restart of the motor after the motor "Call For" signal is received; the delay allows the motor to coast down before restart. The time delay to occurs each time the motor is called to operate. Time delay period is adjustable from 13-165 seconds.
 - 4. Provide common alarm controls, which include a dry-contact output and flashing exterior alarm light output. The controls activate the dry-contact output and flash the alarm light output during motor failure, motor seal failure (if required), or high/low conditions.
 - 5. Provide a motor failure dry-contact output and flashing alarm indicator. The failure controls energize the dry-contact output, flash the motor failure alarm indicator, and energize the common alarm circuitry if the motor fails to run when called for while in the Automatic mode of operation.
 - 6. When the Manual-Off-Automatic switch is in the Manual position M-O-A switch by-passes all the controls and the motor-call-for dry-contacts are energized. In the Manual and Off positions, the motor failure alarm is disabled.

- 7. The Manual-Off-Automatic switch is used to reset a motor failure alarm after the failure condition has been cleared, by rotating the switch to the Off position and returning it to the Automatic position.
- 8. Provide a motor seal failure alarm and indicator, if required, that flashes the indicator and common alarm light output and closes the seal failure dry-contact and common alarm dry-contact output during a seal failure condition. The seal failure alarm automatically resets when the condition clears.
- 9. Provide an input alarm to indicate one of these conditions, if required for operation: high or low condition for level, current or pressure. Provide a red panel indicator and dry-contact output for the alarm. On alarm, flash the indicator, close the alarm dry-contact output and energize the Common Alarm circuitry.
- 10. Provide a field adjustable time delay to prevent motor failure signal from being activated until the controller has had time to receive a "motor running" signal. Timing range is adjustable from 5 seconds to 315 seconds. During motor failure conditions, provide the following controls:
 - (a) Red "Motor Failure" pilot light on face of controller flashes when activated.
 - (b) Activate the Common Alarm relay and exterior flashing light output.
 - (c) Provide a dry-type contact closure for remote alarming that will activate during "Motor Failure" condition.
- 11. The Simplex Motor Controller is solid state and easily replaceable. Conventional relay and/or time construction is not acceptable.
- 12. Provide a lamp test feature to light all front panel pilot lights.

Tag Service SC-1 Screw Pump No. 1 Simplex Controller SC-2 Screw Pump No. 2 Simplex Controller SC-3 Screw Pump No. 3 Simplex Controller SC-4 Screw Pump No. 1 Oiler Simplex Controller SC-5 Screw Pump No. 2 Oiler Simplex Controller SC-6 Screw Pump No. 3 Oiler Simplex Controller SC-7 Aerator No. 1 Simplex Controller SC-8 Aerator No. 2 Simplex Controller Simplex Controller SC-9 Aerator No. 3 Simplex Controller SC-10 Aerator No. 4 SC-11 Aerator No. 5 Simplex Controller Simplex Controller SC-12 Aerator No. 6 Simplex Controller SC-13 Aerator No. 7 Simplex Controller SC-14 Aerator No. 8 SC-15 Aerator No. 9 Simplex Controller SC-16 Aerator No. 10 Simplex Controller SC-17 Clarifier No. 1 Simplex Controller

SC-18 Clarifier No. 2 Simplex Controller

E. Phase Failure, Phase Unbalance, and Phase Reversal Relay: Relay is of the negative sequence filter type. Filter has a high internal impedance for accurate voltage following. Unit is of the voltage comparative type with preset point that will turn off or de-energize the output relay after five seconds.

Tag Service PM Power Monitor

F. Voltmeter: of sealed-case, dust-tight and weatherproof construction. Window is crystal clear acrylic plastic, specially treated to avoid static charges. Dial is completely shadow-free. Provide HI-Q fluid damped taut band suspension system for all moving coil instruments for providing a high level of shock and vibrations protection. Construction using pilots, jewel bearings, hairspring or air damping vanes are not acceptable. Meter is designed to withstand 150 percent overload for two minutes and continuous overload of 120 percent. The sensitivity is 1000 ohms per volt and meter scale has 240 degrees rotation and length of 5 inches.

Tag Service Voltmeter

G. Ammeters: of sealed-case, dust-tight and weatherproof construction. Window is crystal clear acrylic plastic, specially treated to avoid static charges. Dial is completely shadow-free. Provide HI-Q fluid damped taut band suspension system for all moving coil instruments for providing a high level of shock and vibrations protection. Construction using pilots, jewel bearings, hairspring or air damping vanes are not acceptable. Meter is designed to withstand momentary overload of 1000 percent and continuous overload of 120 percent. The meter has a 240 degrees rotation and scale length of 5 inches. Meter has 5 ampere movement. Components of meter are U.L. listed.

<u>Tag</u> <u>Service</u> AM Ammeter

H. Voltmeter and Ammeter Selector Switch: has a detecting angle of 45 degrees. Switch has continuous rating of 600 VAC and make-and-break rating of 60 amps. Contacts are rated to withstand a momentary current of 90 amperes for 3 seconds. Switch has withstand overload current of 20 amperes at 600 VAC for 50 operations. Provide switch with the number of positions as required for the type of electrical service furnished for the project. Switches are UL listed.

Tag Service
Voltmeter Switch
AS Ammeter Switch

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install power control center on 4-inch high concrete housekeeping pad sized 6 inches greater on each end and 6 inches greater than the depth of the PCC. Install the power control center plumb, square and level.
- B. Provide 3-inch wide steel channels embedded in the top of the pad at the front and rear of the PCC for anchoring the unit.
- C. Where PCC is installed against an outside wall, provide 1-inch air gap and ½-inch thick insulation board between the PCC and the wall to allow air circulation and reduce condensation on the PCC. Attach the insulation board to the wall with manufacturer's approved adhesive. Neatly trim insulation board to match the lines of the PCC.
- D. Close all openings in the top or side of sections not required for conduits or manufacturer's ventilation requirements.
- E. Neatly train conductors throughout the control center, supporting and binding the conductors with tie-wraps or similar product.
- F. Adjust the trip settings of the main circuit breaker and standby source circuit breaker the settings indicated on the Drawings.
- G. Set the ground fault trip units on the main and standby source circuit breakers to the levels recommended by the manufacturer.
- H. Set motor circuit protectors to the lowest setting which permits motor starting without nuisance tripping.
- I. Field test all motor control center components.
- J. Comply with the manufacturer's recommendations in the installation of the Power Control Center.
- K. Comply with manufacturers' recommendations in the installation and adjustment of instrumentation and control devices.

3-02 ENGINEERING SUPERVISION

A. Provide the services of a qualified factory representative of the selected single source system supplier to inspect the completed installation, suggest necessary adjustments to place the system in operation, and instruct operating personnel in the care and operation of the equipment furnished. Provide a minimum of two 2-day trips for start-up service and training of operating personnel. During the first year of operation following acceptance, provide two site visits at intervals of six months, for periods of not less then one day or for as long as may be required to correct any deficiencies covered by the equipment and/or system warranty. Provide these services as a part of the Work.

DIVISION 16 – ELECTRICAL

SECTION 16481

MOTOR CONTROL CENTER

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PART 1 – GENERAL

SECTION 16481

MOTOR CONTROL CENTER

PART 1 - GENERAL

1-01 SCOPE

- A. This Section includes ac motor-control devices rated 600 V and less that are supplied as enclosed units.
- B. Related Sections include the following:
 - 1. Section 16050 Basic Electrical Materials and Methods: general materials and installation methods.
 - 2. Section 16075 Electrical Identification: labeling materials.
 - 3. Section 16123 Building wire and conduit: compression connectors
 - 4. Division 15 for starters furnished as an integral part of mechanical equipment.

1-02 SUBMITTALS

- A. Motor List: For each motor controller, list the motor controlled using the equipment identification. Reflect in the motor list all changes in motor horsepower rating resulting from final equipment selections. Coordinate with equipment providers for other Divisions.
- B. Manufacturers: Certificates, signed by manufacturer's regional manager, certifying that manufacturer complies with requirements specified in "Quality Assurance" Article below.
- C. Product Data: For products specified in this Section. Include dimensions, ratings, and data on features and components. For each controller show the following:
 - 1. Type.
 - 2. NEMA size.
 - 3. Enclosure.
 - 4. Pilot lights.
 - 5. Selector switches.
 - 6. Disconnect.
 - 7. Control transformer.
 - 8. Size of fuse to be installed in each circuit.

- D. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
 - F. Maintenance Data: For products to include in the maintenance manuals specified in Division 1.

1-03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintain, within 50 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.
- B. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer. All like units on the project are interchangeable.
- C. Comply with NFPA 70.
- D. Provide controllers conforming to UL 508 "Industrial Control Equipment".
- E. Listing and Labeling: Provide motor controllers specified in this Section that are listed and labeled by Underwriters Laboratories, Inc., the terms "Listed" and "Labeled" as defined in the National Electrical Code, Article 100.

1-04 COORDINATION

A. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

1-05 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Spare Fuses and Incandescent Indicating Lamps: Furnish 1 spare for every 5 installed units, but not less than 1 set of 3 of each kind.

PART 2 - PRODUCTS

2-01 GENERAL CONSTRUCTION

A. The general construction of motor control center "MCCB" is same as described for MCC in Section 16480.

2-02 MANUAL MOTOR CONTROLLERS

- A. Description: NEMA ICS 2, general purpose, Class A with toggle action and one-piece melting alloy thermal switch, overload element, and, as indicated on the drawings, Hand-Off-Auto selector positions, and red run light.
- B. Rating: Horsepower rate per NEMA standards.
- C. Locking: Arrange for padlocking in the "OFF" position.

2-03 MOTOR CONTROLLERS

- A. Description: NEMA ICS 2, Class A, full voltage, non-reversing, across the line, with under-voltage release, unless otherwise indicated.
- B. Lugs: Provide factory install two-hole compression connectors for termination.
- C. Control Circuit: 120 V; obtained from integral control power transformer. Include a fused control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity. Control power transformers have fuses in each leg of the primary and secondary.
- D. Combination Controller: Factory-assembled combination controller and disconnect with or without overcurrent protection, as indicated on the Drawings.
 - 1. Molded Case Switch: NEMA AB1, molded case (magnetic only) motor circuit protector, with lockable handle.
- E. Overload Relay: Ambient-compensated type with inverse-time-current characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect, and with appropriate adjustment for duty cycle. Provide an external reset mechanism.
- F. Multi-speed Motor Controller: For two-speed motors provide controllers for two-speed two-winding motors. Match controller to motor type, application, and number of speeds; include the following accessories:
 - 1. Compelling relay ensures motor will start only at low speed.
 - 2. Accelerating relay ensures properly timed acceleration through speeds lower than that selected.
 - 3. Decelerating relay ensures automatically timed deceleration through each speed.
 - 4. Pilot lights for "slow", "fast" and "stop".
- G. Auto-transformer reduced voltage controllers: NEMA ICS 2, closed transition, for installation in Motor Control Center and use a by-pass controller for variable frequency drive.

2-04 VARIABLE DRIVES

- A. Variable drives furnished in accordance with Section 16482 in "MCCB." Variable drives are shipped to MCC manufacturer's factory for installation. Do not field install variable drives.
- B. Provide compartments for variable drives appropriately sized as required for ventilation requirements of the variable drive manufacturer.

2-05 ENCLOSURES

A. Description: Indoor surface-mounted cabinets NEMA 250, Type 1 with urethane gaskets.

2-06 ACCESSORIES

- A. Devices are factory installed in each motor controller enclosure, unless otherwise indicated.
- B. Selector switches are lockable in any position.
- C. Pushbutton Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty, oil-tight type. Pilot lights (green-stop; red-run; amber-slow; blue-fast) heavy-duty oil-tight diode or resistor type.
- D. Control Relays: Auxiliary and adjustable time-delay relays in multi-speed and star-delta controllers.
- E. Auxiliary Contacts: Two N.O. and two N.C., field convertible.
- F. Current-Sensing, Phase-Failure Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage. Provide adjustable response delay.
- G. Factory mounted with UL, Inc. listed and labeled mounting device.

PART 3 - EXECUTION.

3-01 APPLICATIONS

- A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.
- B. Select horsepower rating of controllers to suit motor controlled.
- C. Use fractional-horsepower manual controllers for single-phase motors, unless otherwise indicated.

- D. Hand-Off-Automatic Selector Switches: In covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment.
- E. Influent pumps shall be started and stopped based on wet well level. Logic and input/outputs for control of the pumps shall be provided at the Programmable Logical Controller (PLC) located at MCCA. A submersible pressure/level transducer shall be provided per component specifications as the primary level input signal. Provide back-up float switches per component specifications for high-level alarm and pumps stop inputs. The float switches shall provide start and stop command inputs to the PLC in the event the submersible pressure/level transducer fails.
- F. Programming shall be provided at the PLC for starting and stopping the pumps based on wet well level in the following sequence.
 - Level 1 Low Level Alarm Float Input (Back-up All Pumps Stop).
 - Level 2 All Pumps Stop (Falling Level).
 - Level 3 Start Lead Small Pump (Rising Level).
 - Level 4 Start Lag Small Pump (Rising Level).
 - Level 5 Stop Small Pump/Start One Large Pump (Rising Level).
 - Level 6 High Level Alarm Float Input (Back-up Start One Large Pump).

PLC programming shall be provided so that in automatic mode, both large pumps are prevented from running simultaneously. Programming shall be provided to alternate all large and small pumps after each pump down cycle. In addition, programming shall be provided to alternate pumps based on Maximum Run Time (MRT). The MRT for each pump shall be adjustable by the WWTF operator.

Analog speed reference command outputs for each large pump VFD shall be provided at the PLC. The speed set point value for each pump shall be adjustable by the WWTF operator. In automatic mode, each pump shall ramp up to the set point speed value each time the pump is called to run. The pumps shall operate constantly at the set point value until a pump stop command is generated.

- G. Provide the following pump control components at the Influent Pump Station.
 - 1. Submersible Pressure/Level Transducer Provide a solid-state direct submersible transducer with a stainless steel housing. The range of the transducer shall be 0-30 PSI with excitation voltage of 15-45 VDC. The transducer shall incorporate a diffused silicon semiconductor sensor protected by an integral stainless steel diaphragm and fill fluid. The transducer shall be able to be mounted at the bottom of a pit with support bracket and be cable connected, providing an analog input signal to a PLC. The analog signal shall be 4-20 mA. The operating temperature shall be -40 degrees to 176 degrees F and the accuracy shall be ± 0.5% O.S. (including linearity, hysteresis and repeatability.)
 - 2. Back-up Float Switches Provide 2/each back-up float switches. Each float switch shall be a direct acting switch and contain a single pole mercury switch

that actuates when the longitudinal axis of the float is horizontal and de-actuates when the liquid level falls 1" below the actuation elevation. The float shall have a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. One end of the cable shall be permanently connected to the enclosed mercury switch and the entire assembly shall be capsulated to form a completely watertight and impact resistance unit.

3-02 INSTALLATION

- A. Install independently mounted motor-control devices according to manufacturer's written instructions.
- B. Heater elements: Provide overload heater elements for overload relays except controllers factory pre-wired with equipment. Provide properly sized heater elements, taking into account duty cycle, type starting, and ambient temperature of motor and starter. Select overload relays based upon motor nameplate full load amperes (FLA).
- C. Location: Locate controllers within sight of motors controlled, unless otherwise indicated.
- D. In Sight of Motor: For each motor that is not in sight of the controller, provide a manually operated disconnect switch to disconnect the motor from the source of supply and which is placed in sight of the motor location.
- E. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks conforming to Division 16 Section "Basic Electrical Materials and Methods."
 - F. Install freestanding equipment on concrete equipment bases conforming to Division 3.

3-03 IDENTIFICATION

A. Identify motor-control components and control wiring according to Division 16 Section "Electrical Identification."

3-04 CONTROL WIRING INSTALLATION

- A. Wiring between motor-control devices according to Division 16 Section "Building Wire and Cable".
- B. Bundle, train, and support wiring in enclosures.

- C. Provide control wiring shown or called for on Division 16 drawings. Connect hand-off-automatic switch and other automatic control devices where available.
 - 1. Connect selector switches with motor-control circuit in both hand and automatic positions for safety-type control devices such as limit switches, control switches, pushbutton stations, and motor overload protections.

3-05 CONNECTIONS

A. Tighten connectors, terminals and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torquetightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

3-06 FIELD QUALITY CONTROL

- A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test.
 - 2. Remove and replace malfunctioning units with new units, and retest.

3-07 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

3-08 DEMONSTRATION

- A. Training: Engage a factory-authorized service representative to demonstrate solid-state and variable-speed controllers and train maintenance personnel.
 - 1. Conduct a minimum of 2 hours of training in operation and maintenance as specified in Division 1 Section "Project Closeout". Include training relating to equipment operation and maintenance procedures.
 - 2. Schedule training with at least 7 days' advance notice.

DIVISION 16 – ELECTRICAL

SECTION 16482

VARIABLE FREQUENCY DRIVES

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SECTION 16482

VARIABLE FREQUENCY DRIVES

PART 1-GENERAL

1-01 SCOPE

- A. This Section includes ac motor-control devices rated 600 V and less that are supplied as enclosed units.
- B. Related Sections include the following:
 - 1. Section 16050 Basic Electrical Materials and Methods: general materials and installation methods.
 - 2. Section 16075 Electrical Identification: labeling materials.
 - 3. Section 16123 Building Wire and Cable: compression connectors.
 - 4. Division 15 for starters furnished as an integral part of mechanical equipment.
- C. Variable frequency drives (VFD) are provided by Division 16 including concrete equipment pads for controller and components. Provide branch circuit wiring to the VFDs and from the VFDs to the motors they control, including termination of conductors.
- D. Variable frequency drives which are installed in control panel by a system manufacturer are installed in the control panel at the control panel manufacturer's factory and are not a part of Division 16 work.

1-02 SUBMITTALS

- A. Motor List: For each variable frequency motor controller, list the motor controlled using the equipment identification. Reflect in the motor list all changes in motor horsepower rating resulting from final equipment selections. Coordinate with the motor supplier and provide VFDs properly matched with the motor provided.
- B. Manufacturers: Certificates, signed by manufacturer's regional manager, certifying that manufacturer complies with requirements specified in "Quality Assurance" Article below.
- C. Product Data: For products specified in this Section. Include dimensions, ratings, and data on features and components. For each controller show the following:
 - 1. Type.
 - 2. NEMA size.
 - Enclosure.

- 4. Pilot lights.
- 5. Selector switches.
- 6. Disconnect.
- 7. Control transformer.
- 8. Size of fuse to be installed in each circuit.
- D. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- F. Maintenance Data: For products to include in the maintenance manuals specified in Division 1.

1-03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintain, within 50 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.
- B. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer. All like units on the project are interchangeable.
- C. Comply with NFPA 70.
- D. Provide controllers conforming to UL 508 "Industrial Control Equipment".
- E. Listing and Labeling: Provide motor controllers specified in this Section that are listed and labeled by Underwriters Laboratories, Inc., the terms "Listed" and "Labeled" as defined in the National Electrical Code, Article 100.

1-04 COORDINATION

A. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

1-05 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

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1. Spare Fuses and Incandescent Indicating Lamps: Furnish 1 spare for every 5 installed units, but not less than 1 set of 3 of each kind.

PART 2 - PRODUCTS

2-01 VARIABLE FREQUENCY DRIVES

- A. Description: NEMA ICS 2, variable-frequency controllers, listed and labeled as a complete unit and arranged to provide variable speed of a standard NEMA MG 1, Design B, 3-phase, induction motor by adjusting output voltage and frequency.
- B. Design and Rating: Match load type such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
- C. Output Rating: 2.5 Hz, pulse width modulated (PWM).
- D. Starting Torque: 100 percent of rated torque or as indicated.
- E. Speed Regulation: Plus or minus one percent.
- F. Ambient Temperature: 0 to 40 deg C.
- G. Efficiency: 98 percent minimum at full load and 60 Hz; 95 percent at half load.
- H. Isolated control interface allows controller to follow an electrical signal (4 to 20 mA at 24V.) over a speed range of 11:1.
- I. Internal Adjustability: Include the following internal adjustment capabilities:
 - 1. Minimum Speed: 5 to 25 percent of maximum rpm.
 - 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 - 3. Acceleration: 2 to 22 seconds.
 - 4. Deceleration: 2 to 22 seconds.
 - 5. Current Limit: 50 to 110 percent of maximum rating.
- J. Self-protection and reliability features include the following:
 - 1. Input transient protection by means of surge suppressors.
 - 2. Snubber networks to protect against malfunction due to system voltage transients.
 - 3. Motor Overload Relay: Adjustable and capable of NEMA 250, Class 10 performance.

- 4. Notch filter to prevent operation of the controller-motor-load-combination at a natural frequency of the combination.
- 5. Instantaneous overcurrent trip.
- 6. Loss of phase protection.
- 7. Reverse phase protection.
- 8. Under-and over-voltage trips.
- 9. Over-temperature trip.
- 10. Short-circuit protection.
- K. Automatic Reset/Restart: Attempt 3 restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Restarting during deceleration will not damage controller, motor, or load.
- L. Status Lights: Door-mounted LED indicators to indicate the following conditions:
 - 1. Power on.
 - 2. Run.
 - 3. Over-voltage.
 - 4. Line fault.
 - 5. Overcurrent.
 - 6. External fault.
- M. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.
- N. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate controller output current, voltage, and frequency.
- O. Integral circuit breaker disconnect.
- P. Bypass Controller: NEMA ICS 2, auto transformer, non-reversing motor controller, provides starting capability in manual-bypass mode. Provide motor overload protection under both modes of operation with control logic that allows common start-stop capability in either mode.

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Q. Isolating Switch: Non-load-break switch arranged to isolate variable-frequency controller and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

2-02 ENCLOSURES

- A. Description: Constructed for installation in motor control center; see Section 16481.
- 2-03 ACCESSORIES
- A. Devices are installed in the motor control center enclosure, unless otherwise indicated, at the PCC provider's factory.
- B. Selector switches are lockable in any position.
- C. Pushbutton Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty, oil-tight type. Pilot lights heavy-duty oil-tight diode or resistor type.
- D. Control Relays: Auxiliary and adjustable time-delay relays in multi-speed and stardelta controllers.
- E. Auxiliary Contacts: Two N.O. and two N.C., field convertible...
- F. Current-Sensing, Phase-Failure Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage. Provide adjustable response delay.
- G. Mounted with UL, Inc. listed and labeled mounting device.

PART 3 - EXECUTION

3-01 APPLICATIONS

- A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.
- B. Select horsepower rating of controllers to suit motor controlled.
- C. Use fractional-horsepower manual controllers for single-phase motors, unless otherwise indicated.
- D. Hand-Off-Automatic and Speed Adjustment Switches: In covers of controllers for motors started and stopped by automatic controls or interlocks with other equipment.

3-02 INSTALLATION

- A. Install independently mounted motor-control devices according to manufacturer's written instructions.
- B. Heater elements: Provide overload heater elements for overload relays, except for controllers factory-wired with equipment. Provide properly sized heater elements, taking into account duty cycle, type starting, and ambient temperature of motor and starter. Select overload relays based upon motor nameplate full load amperes (FLA).
- C. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components, including the pre-testing and adjustment of variable frequency controllers.

3-03 IDENTIFICATION

A. Identify motor-control components and control wiring according to Division 16 Section "Electrical Identification."

3-04 CONTROL WIRING INSTALLATION

- A. Wiring between motor-control devices according to Division 16 Section "Building Wire and Cable".
- B. Bundle, train, and support wiring in enclosures.
- C. Provide control wiring shown or called for on Division 16 drawings. Connect hand-off-automatic switch, speed selector and other automatic control devices where available.
 - 1. Connect selector switches with motor-control circuit in both hand and automatic positions for safety-type control devices such as limit switches, control switches, pushbutton stations, and motor overload protections.

3-05 CONNECTIONS

A. Tighten connectors, terminals and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torquetightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

3-06 FIELD QUALITY CONTROL

- A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test.

2. Remove and replace malfunctioning units with new units, and retest.

3-07 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

3-08 DEMONSTRATION

- A. Training: Engage a factory-authorized service representative to demonstrate variable frequency drives and train maintenance personnel.
 - 1. Conduct a minimum of 4 hours of live, on-site training in operation and maintenance as specified in Division 1 Section "Project Closeout". Include training relating to equipment operation and maintenance procedures.
 - 2. Provide VHS format video-tape of operation and maintenance training for use in future training.
 - 3. Schedule training with at least 7 days' advance notice.

DIVISION 16 – ELECTRICAL

SECTION 16491

FUSES

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SECTION 16491

FUSES

PART 1 - GENERAL

- SECTION INCLUDES
- A. Fuses.
- B. Spare fuse cabinet.
- 1-02 **REFERENCES**
- NEMA FU 1 Low Voltage Cartridge Fuses; National Electrical Manufacturers A. Association: 1986.
- В. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999.
- 1-03 **SUBMITTALS**
- Α. See Section 01300 – Special Contract Requirements, for submittal procedures.
- В. Product Data: Provide data sheets showing electrical characteristics, including timecurrent curves.
- 1-04 **QUALITY ASSURANCE**
- A. Conform to requirements of NFPA 70.
- Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the B. purpose specified and indicated.
- MAINTENANCE MATERIALS 1-05
- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Furnish one fuse puller.
- C. Furnish three of each size and type fuse installed.

PART 2 - PRODUCTS

- 2-01 **FUSES - GENERAL**
- Α. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Provide all fuses as Bussmann or Ferraz/Shawmut types as follows:
- 1. Motors, Welders, Transformers, and other heavy inrush circuits:

	<u>Bussmann</u>	Shawmut
a. Circuits up to 600 amperes:		
(1) (250V) UL Class RK1	LPN-RK	A2D
(2) (600V) UL Class RK1	LPS-RK	A6D
Control and Lighting:		

- 2.
 - a. Circuits up to 30 amperes:
 - (600V) UL Class CC (1) KTK-R A6Y Type 2

2-02 SPARE FUSE CABINET

- A. Description: Wall-mounted sheet metal cabinet with shelves, suitably sized to store spare fuses and fuse pullers specified.
- B. Doors: Hinged, with hasp for padlock.
- C. Finish: gray baked enamel

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Install fuses with label oriented such that manufacturer, type, and size are easily read.
- B. Install spare fuse cabinet in room with Power Control Center.

DIVISION 16 – ELECTRICAL

SECTION 16510

LIGHTING FIXTURES

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3-08	LAMPS

SECTION 16510

LIGHTING FIXTURES

PART 1 - GENERAL

1-01 SECTION INCLUDES

- A. Interior luminaires and accessories.
- B. Ballasts.
- C. Lamps.
- D. Accessories.

1-02 REFERENCES

- A. ANSI C82.1 American National Standard Specifications for Fluorescent Lamp Ballasts; 1985 (R1992).
- B. ANSI C82.4 American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 1992.
- C. NECA/IESNA 500 Recommended Practice for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 1998.
- D. NECA/IESNA 502 Recommended Practice for Installing Industrial Lighting Systems; National Electrical Contractors Association; 1999.
- E. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.

1-03 SUBMITTALS

- A. See Section 01300 Special Contract Requirements, for submittal procedures.
- B. Product Data: Provide dimensions, ratings, and performance data.
- C. If substitute fixtures are proposed for pole mounted fixtures, provide computer prepared photometric layout of proposed lighted area which indicates by isofootcandle readings that system performance of the substitute fixtures matches or exceed the performance of the specified fixtures

1-04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2-01 LIGHTING FIXTURES

A. Provide lighting fixtures of the type, quality and rating indicated by the "Lighting

- Fixture Schedule" on the drawings and as specified herein furnished complete with hangers, fuses, mounting brackets, poles, and pole bases.
- B. Provide proper mounting accessories for the particular recessed, surface or pole mounting required. Provide appropriate trim on recessed fixtures to match the ceiling materials.

2-02 BALLASTS AND CONTROL UNITS

- A. Fluorescent Ballasts: fully electronic, suitable for lamps specified.
 - 1. Voltage: as indicated on the Lighting Fixture Schedule.
 - 2. CBM certified, Type "P" fluorescent ballast design and construction.
- B. High Intensity Discharge (HID) Ballasts: ANSI C82.4, high pressure sodium lamp ballast, suitable for lamp specified.
 - 1. Voltage: Match luminaire voltage.
 - 2. Premium type; provides power for only one H.I.D. lamp.
 - 3. Constant wattage autotransformer or other circuit type with minimum .85 power factor for high pressure sodium lamps and .90 power factor for metal halide lamps.
 - 4. Emergency backup battery systems: CBM certified, Type "P" fluorescent ballast design and construction.
- C. Emergency backup battery systems: Where scheduled provide backup battery system provide battery system having capacity to operate two 48" T8 or one 96" T8 fluorescent lamps; provide system with nickel cadmium battery capable of minimum lumen output of approximately 1100 lumens for a minimum of 90 minutes.

2-03 LAMPS

- A. Lamp Types: As specified for each luminaire.
- B. Provide all lamps of a specific type as the products of the same manufacturer.
- C. Incandescent Lamps: Provide lamps as scheduled on the lighting fixture schedule.
- D. Fluorescent Lamps: Provide lamps as scheduled on the lighting fixture schedule.
 - 1. Product: Provide T8/741 lamps with CRI of 75.
 - 2. Provide compact fluorescent lamps having end-of-life- safety shut-off.
- E. High Intensity Discharge (HID) Lamps:
 - Product: Provide lamps as scheduled on the lighting fixture schedule.

2-04 ACCESSORIES

A. Provide anchor bolts for lighting fixture poles.

PART 3 - EXECUTION

3-01 INSTALLATION

A. Prior to ordering fixtures, coordinate with ceiling installer so proper fixture trim is provided.

- B. Provide jack chain required to suspend chain-hung luminaires at indicated height.
- C. Locate recessed ceiling luminaires as indicated on lighting plan.
- B. Coordinate with installer HVAC grilles and diffusers in placing recessed fixtures to prevent conflicts of placement and ductwork during construction.
- F. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other.
- G. Exposed Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.
- H. Install recessed luminaires to permit removal from below.
- I. Install clips to secure recessed grid-supported luminaires in place.
- J. Install fixtures with hinged doors so fixtures within the same room hinge from same side.
- K. Connect luminaires and exit signs to branch circuit outlets provided under Section 16138 using flexible conduit, see Section 16131.
- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.
- N. Install specified lamps in each luminaire and emergency lighting unit.

3-02 SITE LIGHTING

Provide concrete bases and mount pole as detailed on the drawings.

- A. Install pole mounted site light units at locations shown on the drawings.
- B. Orient poles such that fixture positions are parallel or perpendicular with major building lines or driveways/roadways.

3-03 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 01400.
- B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.
- C. Do not remove factory-installed protective plastic film cover from diffusers and downlights until Substantial Completion.

3-04 ADJUSTING

- A. Aim and adjust luminaires as indicated.
- B. Position exit sign directional arrows as indicated.

3-05 CLEANING

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from lenses and enclosures.
- C. Clean finishes and touch up damage.
- D. Remove protective plastic film cover from diffusers and downlights.

3-06 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate luminaire operation for minimum of two hours.

3-07 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3-08 **LAMPS**

A. Lamps are excluded from the guarantee, but it is the responsibility of the Contractor to ensure that one complete and operative set of lamps for each lighting fixture are in place at time of Substantial Completion.

DIVISION 16 – ELECTRICAL

SECTION 16821

MISCELLANEOUS RACEWAY SYSTEMS

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PART 3	– EXECUTION

PART 1 – GENERAL

3-01 INSTALLATION

SECTION 16821

MISCELLANEOUS RACEWAY SYSTEMS

PART 1 - GENERAL

- 1-01 SCOPE
- A. Raceway system and backboard for telephone and data systems.
- B. Raceway system for monitoring, instrumentation and control (SCADA) systems.
- C. Extent of the work is indicated on the drawings.
- 1-02 REFERENCES
- A. NFPA 70 National Electrical Code; National Fire Protection Association; 1999.
- 1-03 QUALITY ASSURANCE
- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1-04 SUBMITTALS

A. Submit shop drawings and product data, in accordance Section 01330 - Submittal Procedures

PART 2 - PRODUCTS

2-01 TELEPHONE AND DATA SYSTEMS

- A. For wall mounted telephone/data outlets provide 4 inch square box in wall with single gang raised plaster ring and blank cover plate Provide ¾ inch EMT stubbed into the ceiling space 6 inch, with pullwire from box into ceiling space.
- B. Provide two 4 inch Schedule 40 PVC raceways into the building from a point 24 inches from the edge of the entry drive; cap raceways at each end. Install raceways at 36 inches below finished grade. Terminate the raceway inside the building at the telephone terminal board.
- C. Provide 24 inch x 48 inch x ¾ inch exterior grade plywood backboard for a telephone terminal board. Install the board vertically on the wall with bottom of board 6 inches above the floor. Paint the backboard flat black.

- D. Provide a 6 inch long x 2 inch wide x ¼ inch thick copper busbar mounted on insulators at 12 inches above the bottom of the board. Provide busbar having 7/16 inch diameter holes drilled with 2 inch x ¾ inch spacing for field installation of screws and lugs.
- E. Provide one #6 bare copper ground from the busbar to the building electrical service ground.

2-02 SCADA SYSTEMS

A. Provide raceway system from the field mounted monitor, control and instrumentation devices to the PLC section of the Power Control Center and MCCB.

PART 3 - EXECUTION

3-01 INSTALLATION

- A. Provide raceways of the materials indicated in Section 16131.
- B. Install raceways as indicated in Section 16131
- C. Provide #9 gauge steel pullwire or 200 pound tensile strength nylon rope in empty raceways.
- D. Use long radius sweeps for telephone system raceways.
- E. Provide pullboxes to facilitate installation of cabling, with no more than three 90 degree bends in raceways between pullboxes.



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August 24, 2002

Project No: 522113-1

EAI/WEI, LLC 143-A LeFleurs Square Jackson, Mississippi 39211

Attention: Mr. James L. Hust, III, P.E.

Re: Geotechnical Investigation

Short Fork Creek Wastewater Treatment Facility – Flinn Site

DeSoto County, Mississippi

WEI #D00-064

Gentlemen:

Submitted herein are the results of our geotechnical investigation for the wastewater treatment facility proposed for construction on the Flinn Site in DeSoto County, Mississippi. This work was authorized by approval of our June 18, 2002 proposal by Mr. James L. Hust, III, P.E. on July 22, 2002.

The location of the Flinn Site for the Short Fork Creek Wastewater Treatment Facility (Short Fork Creek WWTF) is in the Southwest 1/4 of Section 24, Township 3 South, Range 7 West in DeSoto County, Mississippi. The site is relatively flat with ground surface elevations ranging from 246 to 251 ft NGVD. The area of proposed construction is located east of Short Fork Creek, west of Camp Creek Canal, and north of Holly Springs Road. In addition to the WWTF, two borrow areas are being considered to provide soil for the proposed construction. The West Borrow Area is located west of Short Fork Creek west of the WWTF and the South Borrow Area is located east of Short Fork Creek and south of the WWTF.

Prior to the selection of this site, four borings had been drilled within the proposed construction area as part of a preliminary investigation performed on a number of alternate sites. During the period July 25 through July 30, fourteen additional borings were advanced at the site of the proposed WWTF, four additional borings were performed in the proposed West Borrow Area, and two additional borings were placed in the proposed South Borrow Area.

The majority of the near-surface soils at this site are silty clay (Unified Soil Classification – CL) and clayey silt (ML or CL-ML). These soils extend from the ground surface to depths that range from 22 to 30 ft below the existing ground surface. The site has been plowed and the surface soils within the upper 2 ft are generally wet and soft/loose. At some locations, the wet, soft/loose soils extend to depths of 4 to 5 ft. Below a depth of about 5 ft, the soils become firm to stiff (silty clays) or medium dense (silts). However, there are intermittent zones of wet and soft/loose soil within this upper stratum. Where present, these zones are typically 10 to 15 ft below the ground surface. Underlying the near-surface fine-grained soils is a stratum of loose to medium dense clayey sand (SC). This clayey sand is present to depths of 28.5 to 36 ft below the ground surface and grades into a dense to very dense sand (SP). The sand is present to the terminal depths of these borings.

During advancement of the soil borings, the upper portion of the borings was dry augered to allow determination of the groundwater levels within the borings. Additionally, the borings were allowed to remain open for at least 24 hours and the water levels rechecked. In general, free groundwater appears to be present at depths of about 1.5 ft to 5.5 ft below the ground surface. However, this free water appears to be surface water that has infiltrated into the soil and become perched in the loose, plowed soils above the less permeable undisturbed silty clay and clayey silt. Periodic checks of the water levels in the open borings and in the piezometers did not indicate a significant rise in the groundwater levels.

The attached report presents details of our findings related to the soil and groundwater conditions. Detailed recommendations related to site preparation, surface drainage improvement, excavation dewatering, fill placement, and foundations for structures are also presented.

We appreciate the opportunity to assist you with this project. Please call if you have any questions or if we can assist you in any way.

Sincerely,

Aquaterra Engineering, LLC

Bradley W. Martin, P.E.

David M. Coleman

DMC/mnm

Copies Submitted:

Waggoner Engineering – Jackson – Arnold – 3

Waggoner Engineering – Hernando - Huffman – 1

Engineering Associates – Jackson - Husman – 2

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Geotechnical Investigation Short Fork Creek Wastewater Treatment Facility Flinn Site DeSoto County, Mississippi

1.0 INTRODUCTION

The DeSoto County Regional Utility Authority is planning the construction of a new Wastewater Treatment Facility on a site in DeSoto County, Mississippi. Figure 1 presents a site location map showing the general location of the proposed treatment facility.

1.1 Purpose and Scope

Aquaterra Engineering, LLC (Aquaterra) was retained by EAI/WEI, LLC (EAI/WEI) to conduct a geotechnical investigation for the proposed wastewater treatment facility. This investigation was intended to provide an understanding of the subsurface conditions at the Flinn Site and to develop options available for site preparation and foundation design for the new wastewater treatment facility. Prior to this investigation, a previous investigation had been performed on the Davis Site (Aquaterra Report 522075, dated May 22, 2002) and preliminary investigations were performed on eight alternate locations to assist in selecting a suitable site (Aquaterra Report 522113, dated June 8, 2002).

The scope of this geotechnical investigation was developed by Aquaterra in conjunction with Mr. Tracy Huffman, P.E. of Waggoner Engineers, Inc. The geotechnical investigation conducted for this project included the following:

- A reconnaissance of the project site to document physical conditions pertinent to the geotechnical investigation;
- Drilling and sampling of fourteen soil borings across the treatment facility site. The locations of these borings are shown on Figure 2.
- Drilling and sampling of four soil borings within the proposed West Borrow Area (Figure 2) and two borings in the proposed South Borrow Area (Figure 3).
- Drilling and sampling of one soil boring along the proposed route of the gravity sewer line serving the plant. The location of this boring is shown in Figure 4.
- The determination of index and engineering properties of selected soil samples by means of geotechnical laboratory testing; and
- The performance of engineering analyses and the development of this report to present the findings of the investigation and guideline recommendations for site preparation and foundation design.

1.2 Procedures

This investigation followed procedures established by our firm as routine for a geotechnical investigation of this nature with sampling and analyses in general accordance with appropriate guidelines established by the American Society of Testing and Materials (ASTM). Appendix A describes the field and laboratory procedures utilized to accomplish this geotechnical investigation.

2.0 PROJECT INFORMATION

The following paragraphs present the project information that was available at the time this report was prepared. Should this information be incorrect, or change significantly, please contact the project engineer so that our analyses and recommendations can be reevaluated.

The new wastewater treatment facility will be located on an approximate 105-acre parcel located approximately 5 miles east of Hernando. The facility will be constructed between Short Fork Creek and Camp Creek Canal in a floodplain area. Plans are to raise the site to about El. 260, which will require the placement of approximately 9 to 12 ft of fill material across the site. Current plans are to obtain this fill material on site from the proposed West and South Borrow Areas. Phase 1 construction will consist of an administration building/laboratory, influent pump station, headworks, influent splitter box, aeration basin, two clarifiers, sludge digester, sludge belt press, UV disinfection/Parshall flume, post-aeration basin, effluent pumps, and two sludge lagoons.

3.0 SITE CONDITIONS

In a geotechnical investigation of this nature, local topography and surface conditions, geologic setting and site-specific soil and groundwater conditions are important. The following paragraphs summarize our findings relative to these topics.

3.1 Physical Setting

The site is located in the Southwest 1/4 of Section 24, Township 3 South, Range 7 West in DeSoto County, Mississippi. The area of proposed construction is located between Short Fork Creek to the west and Camp Creek Canal to the east. The area is relatively flat with ground surface elevations ranging from 246 to 251 ft NGVD. Review of the topographic information provided by EAI/WEI indicates that in the vicinity of the WWTF, the general slope of the ground surface and the site drainage is to the southeast. The ground surface elevation is approximately 250 in the northwest corner of the plant site and about 247 in the southeast portion of the plant site near the lagoons.

The ground surface in the West Borrow Area slopes downward from the northwest to the southeast with the ground surface elevations ranging from about 251.5 to 248 ft. The South Borrow Area is very flat with ground surface elevations ranging from 246 to 247.5.

The primary use of the proposed construction area has been an agricultural field. As a result, the upper soils have been aerated which allows rapid water penetration. At the time of this investigation, the site of the treatment plant and the West Borrow Area was plowed and was planted with soybeans. The South Borrow Area was vegetated with weeds and field grasses.

3.2 Geologic Setting

Geologically, this site is located within alluvial deposits of the Coldwater River, Camp Creek, and Short Fork Creek. The site is underlain by the soils of the Kosciusko Formation. Alluvial deposits typically consist of interbedded silt, clayey silt, silty clay, and clay underlain by more granular silty sand, clayey sand, and sand. The soils of the Kosciusko Formation typically consist of irregularly-bedded sands, sandy clay, clay and quartzite.

3.3 Soil Conditions

The twenty-four soil borings advanced for this investigation encountered areas of similar soil conditions across this site. The soil conditions were divided into areas that include the northern, central, and southern portions of the facility and the western and southern borrow pit areas. The soil boring logs in Appendix A provide details of the conditions encountered at each boring location and the field and laboratory data collected. Table 1 presents a summary of the statragraphic conditions encountered in this investigation. Table 2 presents a statistical summary of the laboratory data collected during this investigation. The following paragraphs present descriptions of the conditions that were encountered.

- 3.3.1 WWTF Northern Section: The northern section of the site includes soils underlying the administration building, the clarifier, the aerator basin, the headworks, and the influent pump station. This area was investigated by means of Borings B-45, B-46, B-47, B-48, B-49, and B-51. The near-surface soils throughout this portion of the site consist of surficial soft to stiff silty clay (Unified Soil Classification-CL) with discontinuous layers of clayey silt. The clayey silt (ML) layers were very loose to medium dense in consistency and up to 9 ft thick. These silty clays and clayey silts extended to a depth of between 22 ft and 24 ft and were underlain by loose clayey sand (SC). These clayey sands extended to a depth range between 28 ft to 36 ft. The clayey sands were in-turn underlain by medium dense to very dense sand (SP) that extended to the terminal depth of the borings. Some of the borings that were terminated at 20 ft did not encounter the clayey sands or sands.
- **3.3.2 WWTF Central Section:** The central section of the site includes soils underlying the digester, the solids handling structure, the UV flume and the effluent pumps. This portion of the site was investigated by means of Borings B-36, B-42, B-43, B-44, and B-50. The near-surface soils throughout this portion of the site consist of surficial very soft to stiff silty clay (CL) with discontinuous layers of clayey silt. The clayey silt (ML) layers were very loose to medium dense in consistency and up to 8 ft thick. These silty clays and clayey silts extended to the 20-ft terminal depth of the borings.
- 3.3.3 WWTF Southern Section: The southern section of the site includes soils underlying the lagoons. This portion of the site was investigated by means of Borings B-27, B-38, B-39, B-40, and B-41. The near-surface soils throughout this portion of the site consist of surficial, very soft to stiff silty clay (CL) with discontinuous layers of clayey silt. The clayey silt (ML) layers were very loose to medium dense in consistency and up to 4.5 ft thick. These silty clays and clayey silts extended to the 20-ft to 30-ft terminal depth of the borings. The soil boring in the northwest corner of the lagoon area, Boring B-41, encountered surficial silty clay in the upper 4 ft and clayey silt for the remainder of the 20-ft boring.
- **3.3.4 West Borrow Area:** The west borrow area is located west of Short Fork Creek to the southwest of the plant site. This area was investigated by means of Borings B-24, B-52, B-53, B-54, and B-55. The soils in this area consisted of loose clayey silt (ML) that were present from the ground surface to the terminal depths of the borings in the northern and eastern portions of the borrow area. Moving to the southeast, the depth of the loose clayey silt became less with firm silty clay (CL) present below 6 ft at the location of Boring B-53 and at the ground surface at the location of Boring B-55.
- **3.3.5 South Borrow Area:** The south borrow area is located southeast of the plant site and was investigated by means of Borings B-37, B-56, and B-57. The northern portion of this borrow area has stiff clay (CH) present from the ground surface to a depth of about 4 ft. The southern portion of the site has very soft to soft clay (CH) present to a depth of about 6 ft. Underlying the clay, and present from the ground surface to the terminal depth of the borings are soft to firm silty clay (CL) soils.
- **3.3.6 Gravity Sewer Line:** To provide an idea of the soil conditions along the proposed route of the gravity sewer line, one soil boring (B-58) was advanced about 1.6 miles north-northeast of the plant site. This boring encountered loose, tan clayey silt (ML) from the ground surface to a depth of about 8 ft. The clayey silt became medium dense at about 8 ft and extended to a depth of 18 ft. Stiff, tan and light gray silty clay (CL) was present from 18 ft to the 30-ft terminal depth of the borings.

To assist in the analyses of the soil conditions at the site, four generalized soil profiles were developed. The locations of these soil profiles are shown on Figures 2 and 3 with the actual profiles presented on Figures 5 through 7. Proper note should be taken that these profiles are based on the conditions at discrete boring locations. The soil and groundwater conditions may be different away from or between the boring locations.

3.4 Groundwater Conditions

As described in Appendix A, the soil borings were dry-augered to document the groundwater conditions at the time of our investigation. Additionally, three piezometers were installed to monitor the groundwater levels. The borings were allowed to remain open for at least 24 hours and the water levels rechecked. Table 3 presents a summary of the groundwater data collected at this site.

In general, free groundwater appears to be present at a depth of about 1.5 ft to 5.5 ft below the ground surface in all of the boring locations. However, this free water appears to be perched in the plowed, loose soils above the less permeable, undisturbed silty clay and clayey silt. Periodic checks of the water levels in the open borings did not show a significant rise in the groundwater levels which indicates the absence of significant hydrostatic pressures in this upper groundwater. One piezometer installed within the substratum sands at the site indicate that the phreatic surface is at about El. 244. This phreatic surface elevation indicates an artesian pressure that is equilivant to about 1,250 psf.

Proper note should be taken that groundwater levels will vary with river and creek stages, changes in drainage conditions, changes in rainfall, and other seasonal variations. The depth to groundwater should be verified prior to the initiation of activities that could be impacted by groundwater. The piezometers installed during this geotechnical investigation should be allowed to remain in place and protected during construction to allow for long-term monitoring of the groundwater conditions.

4.0 GEOTECHNICAL CONSIDERATIONS

The information provided by the designers for this project has been combined with our findings from the site investigation to develop guideline recommendations for foundation design. The following paragraphs summarize these considerations. Details are provided in the following sections of this report.

4.1 Design Considerations

The proposed site is relatively flat with small elevation differences. Surface water drainage is fair to poor. The proposed construction and borrow areas have been used for agricultural purposes and water has been allowed to stand on portions of the site. As a result of these activities, the upper 2 ft of soil is generally soft/loose and saturated. The majority of the near-surface soils at this site are silty clay (CL) and clayey silt (ML or CL-ML). These soils extend from the ground surface to depths that range from 22 to 29 ft below the existing ground surface. Substratum sands are present below these depths and extend to the terminal depths of the borings. At some locations, the wet, soft/loose soils extend to depths of 4 to 5 ft. Below a depth of about 5 ft, the soils become firm to stiff (silty clays) or medium dense (silts).

In general, free groundwater appears to be present at depths of about 1.5 ft to 5.5 ft below the ground surface. However, this free water appears to be surface water that has infiltrated into the soil and become perched in the loose, plowed soils above the less permeable undisturbed silty clay and clayey silt. Periodic checks of the water levels in the open borings did not indicate

a significant rise in the groundwater levels which indicates the absence of significant hydrostatic pressures in this upper groundwater. One piezometer installed within the substratum sands at the site indicates that the phreatic surface is at about El. 244 ft. This phreatic surface elevation indicates an artesian pressure that is equilivant to about 1,250 psf. To prevent heaving or "blowout" of excavations, we recommend that any excavations that will be deeper than about El. 235 be completely dewatered. Excavations to depths above about El. 235 should not experience hydraulic heaving, provided that the hydrostatic pressures within the sands do not increase.

The near-surface soils at this site are clayey silts and silty clays that are moisture sensitive. These soils experience a significant loss of strength when wet. Instability (pumping) of the near-surface soils under construction traffic is expected. Surface drainage of the site should be improved and the wet near-surface soils drained by means of bleeder ditches constructed across the site. The bleeder ditches should drain into sumps that collect the water for pumping off site. Construction of the bleeder ditches is necessary to reduce the moisture content in the near-surface soils and to allow the fill placement and construction of the plant to proceed with minimum interruption. These bleeder ditches should be constructed as early in the project as possible to achieve their maximum benefit.

Construction of the new facility will require the placement of 9 to 12 ft of fill to achieve the desired finished grade elevations. Placement of the fill materials and construction of the facility will result in consolidation settlement of the in-place clayey silt and silty clay soils. To minimize consolidation settlement during and after construction, the fill should be placed and the site preloaded with an additional 6 ft of fill material. The fill and preload should be allowed to remain in place for a period of time prior to the start of facility construction.

An alternate method for subgrade stabilization would be soil mixing. Soil mixing can be used to stabilize the soft and wet soils that are present within the top 10 ft of the site. This technique will result in higher allowable bearing capacities for the structures and will minimize future settlements.

The majority of the structure foundations will bear within naturally-deposited silty clay and clayey silt soils. Structures bearing within the select fill may be supported by shallow foundations consisting of mat foundations for the larger structures and continuous footings and spread footings for the smaller structures. Structures bearing within the naturally-deposited soils could also be supported by mat foundations. Shallow foundations may experience some movement as the result of consolidation settlement in the underlying soils. An alternate method for supporting the structures is deep foundations. For this facility, the deep foundations could consist of either auger-drilled, cast-in-place (auger cast) piles or driven concrete piles. Deep foundations have the benefit of allowing construction of the plant structures to begin without the time delay of allowing the fill to completely settle.

Excavations below about El. 235 will require dewatering of the excavation area. We anticipate that the dewatering will require a well-point system to lower the water table within the sand stratum that is present below about El. 224. Significant amounts of dewatering will be required for excavations below this depth.

Within both of the proposed borrow areas, the near-surface soils are loose and groundwater is perched at depths of about 2 to 3 ft below the ground surface. The construction of bleeder ditches is required to evacuate the free water from these soils and to assist in reducing the moisture content. With the current soil conditions, we anticipate that bleeder ditches greater than about 6 ft in depth will slough unless the sides are sloped. Staged construction of the bleeder ditches may be required to adequately remove the groundwater from portions of these

borrow areas. The moisture contents of the soils within the borrow areas are currently in the range of 23% to 32%. Construction of bleeder ditches will result in these moisture contents being reduced somewhat. However, additional processing of the soil will be required to reduce the moisture content to a level where the soils can be placed and properly compacted.

Detailed recommendations related to the construction of this facility are provided in the following sections.

4.2 Soil Profile Type

The soil profile type for seismic design of structures was determined in accordance with Table 1607.3.1 of the "1999 Standard Building Code." This site has a soil profile type S_4 with a site coefficient, S_7 , of 2.0.

5.0 SITE PREPARATION

A critical aspect of the successful construction project is site preparation. Proper site preparation is critical to the overall performance of the foundation system for the proposed structure. This section provides recommendations for site drainage, clearing, excavations, and fill placement.

5.1 Clearing, Grubbing, and Stripping

Clearing, grubbing, and stripping will be necessary to remove all vegetation, roots, other organic matter, and any debris that could otherwise be detrimental to subsequent construction. The site is a combination of agricultural field and relatively open grassy field. Stripping of the topsoil on the order of about 9 to 12 in. is expected to be required in those areas that are currently vegetated with grass and weeds. Stripping on the order of about 12 in. is expected in areas currently planted. Proper note should be taken that stripping should be carried to a depth where all organic-containing soils have been removed. Stripping should be accomplished after the site has been dewatered.

Soils containing objectionable materials should not be used for backfill. Objectionable materials that should be removed include roots, organic matter, and any rubble or debris that may be present. Any topsoil encountered within construction limits should be stripped and could be stockpiled for landscaping purposes.

5.2 Site Drainage

The surface soils throughout the site are soft and wet. Our borings indicate that the soils are wet, soft, and unstable from the ground surface to depths of 2 to 6 ft below the ground surface. In most of the soil borings, the groundwater was present at depths of between 1.5 and 5.5 ft of the ground surface. This groundwater appears to be perched water and not associated with the groundwater that is present in the substratum sand soils. These soils will require dewatering and a reduction in moisture content prior to stripping, site grading, or placement of fill materials.

A series of bleeder ditches should be constructed across the site to assist in the drainage of the near-surface soils. These bleeder ditches should be constructed as soon as possible to allow significant drying of the near-surface soils prior to initiation of earthwork construction. The bleeder ditches should be constructed parallel to each other about 200 ft apart. The ditches should have a minimum depth of 6 ft. Deeper ditches may be possible, but depths greater than about 10 ft should not be necessary. Because of the soft soil conditions near the ground surface, we anticipate that the sides of the ditches will slough at depths of about 6 to 8 ft. Staged construction of the bleeder ditches (initially shallower then deeper as the upper soils dry) may be required to adequately remove the groundwater from portions of these borrow areas.

Lateral ditches should be constructed in a chevron pattern running into the main ditches with a spacing of about 100 ft apart. Proper note should be taken that optimum location and spacing of the bleeder ditches for maximum drainage should be determined by the contractor in the field at the time of construction.

The bleeder ditches for the plant area could drain either toward Short Fork Creek or toward Camp Creek Canal. The construction of sumps near the creeks will be required to collect the water for pumping off site. The bleeder ditches in the West Borrow Area should drain into sumps located on the west side of Short Fork Creek. The bleeder ditches for the South Borrow Area should drain to the southeast to sumps along the west side of Camp Creek Canal. We anticipate that several sumps and pumps will be required to properly drain each of the sites.

The bleeder ditches should be left open and the sumps kept operational for as long as possible during construction. Upon the start of construction, the bleeder ditches should be backfilled with sand to promote free drainage of the soils. The construction of the bleeder ditches and installation of sand at the start of construction will assist in continuing to reduce the moisture contents and improve the condition of the near-surface soils. Upon completion of construction, the ends and tops of the bleeder ditches outside of the construction area should be excavated and backfilled with a silty clay soil to prevent water from the adjacent creeks surcharging the drainage system under the facility.

Depending on the time of year construction occurs, we anticipate that the bleeder ditches should be allowed to remain open for at least 4 weeks to effectively reduce the near-surface soil moisture content. Some maintenance of these bleeder ditches will be required to clear sloughed areas and maintain flow. The silty clay and clayey silt soils excavated from the bleeder ditches could be processed to reduce the moisture content and used as select fill material for the project.

If possible, the site work should take place during the dryer seasons of the year to reduce the potential for construction problems associated with wet soil conditions. Regardless of the time of year construction occurs, proper drainage should be established and maintained during earthwork operations to minimize wet weather delays and to reduce accumulation of moisture. Drainage should be maintained after construction to rapidly remove stormwater from the site. Protection of the site could include the construction of temporary ditches, berms or other surface water diversion devices in order to divert water away from and not across the site.

5.3 Excavations and Dewatering

The excavations required for this project will deteriorate rapidly. All excavations should be made and kept in compliance with the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926). These regulations require that excavations greater than 5 ft in depth be sloped, benched, sheeted, or braced to protect employees working in the excavation against the risk of cave-ins.

For this site, we recommend that shallow excavations (less than 10 ft in depth) have temporary slopes that are no steeper than 1.5 horizontal to 1 vertical where groundwater is not encountered, and no steeper than 3 horizontal to 1 vertical where groundwater is present. Deep excavations will require benching, sheeting, or shoring. Sheet pile walls or shoring systems must be properly designed for the soil and groundwater conditions.

Boring logs indicate any excavations below the ground surface may encounter groundwater within the near-surface soils. Excavations that exceed a depth of about 2 ft (roughly El. 246 in the northern portion of the site or about El. 244 in the southern part of the site) will experience perched water conditions unless the bleeder ditches are excavated and the upper soils at the

site are dewatered. Excavations that are to extend below about El. 235 will require dewatering to prevent hydraulic heave of the excavation. We anticipate that an extensive dewatering system consisting of well-points and pumps will be required to reduce the groundwater levels within the sand stratum that is present below about El. 224 ft in order to prevent excavation heaving due to hydrostatic pressure. The design of the well-point and pump system will be dependent upon the conditions encountered at the time of construction and should be the responsibility of the contractor.

5.4 Proof Rolling

The near-surface soils at this site are extremely wet and unstable. The construction of the bleeder ditches, as recommended above, will assist in reducing the amount of moisture in the near-surface soils. However, we anticipate that significant areas of instability will remain. Proof rolling of the site will likely result in significant rutting of the subgrade and damage to any crust of firm soil provided by the bleeder ditches or surface drying. Proof rolling during the initial stages of earthwork construction is not recommended for this site due to the known wet and unstable soil conditions and the potential damage to the existing subgrade.

If the shallow foundation option given herein is utilized for the proposed structures, the subgrade soils at the location of the structure should be proof rolled. The area checked with the proof roll should include the area of the structure plus a distance of 10 ft outside of the footprint of the structure. After stripping and prior to placing fill, the exposed subgrade should be evaluated to confirm that all soft, yielding, and unsuitable materials have been properly mitigated. The areas should be proof rolled with a loaded tandem-axle dump truck or similar pneumatic-tired equipment with a minimum weight of 15 tons and a maximum weight of 25 tons. Proof rolling will help reveal the presence of unstable materials that were not identified during our drilling program. Any areas that yield or "pump" under the proof roll equipment should be properly mitigated. Mitigation might include processing to remove excess moisture, overexcavation and backfilling, stabilization with hydrated lime, or modification with geotextile reinforcement. Should mitigation be required, this office should be notified so that the project geotechnical engineer can visit the site and prescribe the appropriate mitigation.

5.5 Mitigation of Unstable Soils

We anticipate that wet and unstable soils will be present over most of the proposed construction area at the start of earthwork construction. Mitigation of these unstable soils will be required prior to placement of the fill materials and subsequent construction of the new facility. Based on the results of this investigation, it appears that there are three methods that are feasible for mitigation of the unstable soil conditions. These alternatives are:

- Bleeder Ditches / Sand Blanket / Fill Placement / Preload
- Overexcavation to 3 ft / Fill Placement
- Soil Mixing
- Surface Stabilization

The following sections address methods for mitigation of the unstable subgrade soil conditions.

5.5.1 Bleeder Ditches / Sand Blanket / Fill Placement / Preload: Mitigation of the unstable soils in the areas to receive fill can be accomplished by the installation bleeder ditches as described in Section 5.2 followed by placement of fill with preload over the existing subgrade. The steps in this mitigation alternative are as follows:

- Excavate the bleeder ditches as described in Section 5.2 and allow site to drain.
- Immediately prior to the start of construction, fill the bleeder ditches with clean sand.
 The sand should be non-plastic and have less than 15% of the soil particles passing the No. 200 sieve.
- Place a woven geotextile over the subgrade and sand-filled bleeder ditches. The
 geotextile should have the minimum physical properties given in Table 4. The
 geotextile should have a minimum overlap of 24 in. at all joints. Pinning of the
 geotextile should be performed if required to prevent movement.
- Place an additional 18 in. of clean sand over the geotextile and spread with a light dozer with minimum compaction.
- Place and compact select fill materials in accordance with the recommendation given in Sections 5.6 and 5.7 below. Place the fill materials to the required finished grade plus an additional 6 ft of fill.
- Allow preload to remain in place until a significant amount of settlement has occurred and the remaining settlements are occurring at a uniform rate.

With this alternative, we estimate that preloading of the site for a period of about 12 weeks after placement of all the fill and preload will be required to remove most of the consolidation settlement.

- **5.5.2** Overexcavation to 3 ft / Fill Placement / Preload: This alternative involves complete removal and disposal of the near-surface wet and unstable soils followed by placement of select backfill. The steps in this mitigation alternative are as follows:
 - Overexcavate the fill placement area to a depth of about 3 ft below the existing ground surface elevation. This should remove the majority of the extremely wet and unstable soils. Proper note should be taken that there may be localized areas of unstable soils below this level. These localized areas should be allowed to remain, or, if severe, overexcavated an additional 2 ft and backfilled. This determination should be made in the field at the time of construction by a representative of the geotechnical engineer. If desired, the excavated soils could be processed to reduce the moisture content and reused as fill on other parts of the site.
 - Place a woven geotextile over the subgrade in the excavation. The geotextile should have the minimum physical properties given in Table 4. The geotextile should have a minimum overlap of 24 in. at all joints. Pinning of the geotextile should be performed if required to prevent movement
 - Place initial 12-in. lift of select fill and compact to at least 92% of the Standard Effort (ASTM D 698) maximum dry density.
 - Place subsequent lifts of select fill and compact to 95% of the Standard Effort (ASTM D 698) maximum dry density for the first lift and 98% of the Standard Effort maximum dry density for the subsequent lifts in accordance with Sections 5.6 and 5.7 below. Place the fill materials to the required finished grade plus an additional 6 ft of fill.
 - Allow preload to remain in place until a significant amount of settlement has occurred and the remaining settlements are occurring at a uniform rate.

With this alternative, we estimate that preloading of the site for a period of about 8 weeks after placement of all the fill and preload will be required to remove most of the consolidation settlement.

5.5.3 Soil Mixing: Typically used in soft soils, the soil mixing technique relies on the introduction of a cementitious material to either create a soil-cement matrix for soil stabilization, or to form subsurface structural elements to support earth or building loads. Soil mixing can be accomplished by many methods with a wide range of mixing tools and tool configurations available.

Preliminary design of a soil mixing alternative for this site indicates that dry soil mixing will be the best of the soil mixing alternatives for this site. With this alternative, a dry cementitious material would be injected into the upper 10 ft of soil and mixed. Stabilization of the wet and unstable soils would occur rapidly and fill placement can begin as soon as sufficient working room is available.

With soil mixing, the pattern of injection and mixing can be designed to provide greater support under the structures with only minimal support under non-critical fill areas. The soil mixing alternative has the advantages of:

- Providing a stable subgrade working surface within a relatively short time.
- Providing a volume of cement-stabilized soil residual to the mixing process that can be re-used as embankment fill on the site.
- Eliminating the need for bleeder ditches and pre-construction site drainage.
- Eliminating site surcharge or preloading to reduce consolidation settlement.
- Allowing fill placement to start immediately after a large enough area has been treated.
- Allowing critical path scheduling of the site preparation work so that the areas supporting long lead-time structures can be stabilized first and fill placement can begin.
- Significantly reducing the amount of total and differential settlements that will occur.
 We estimate that total settlements with this method would be about 1.5 in. with maximum differential settlements of about 0.75 in. less.

Preliminary design of this alternative indicates that about 8 weeks will be required to soil mix stabilize the subgrade beneath the structures within the plant area. We estimate that within about 2 weeks after the soil mixing has begun, fill placement could start. A critical path schedule could be developed to allow the most critical areas to be stabilized first so that fill placement and structure construction can proceed.

5.5.4 Surface Stabilization: With this alternative, the clearing, grubbing, and stripping is performed as recommended in Section 5.1. However, the bleeder ditches would not be required as recommended in Section 5.2. Once the site is stripped, the upper 2 ft of the wet/unstable soils are chemically stabilized using hydrated lime or Portland cement. Preliminary estimates indicate that approximately 4.5% by weight (4 lbs per sq yd per in. depth) hydrated lime or approximately 10% by weight (8.1 lbs per sq yd per in. depth) of Portland cement would be required to stabilize the soil. The intent of this chemical stabilization is to develop a working platform that will allow the placement of fill materials. This option could not be used in conjunction with shallow foundation support of the structures. However, it is a feasible means of surface stabilization when the structures will be supported on deep foundations. If this method is chosen, a test section should be constructed to determine the optimum amount of chemical additive, fine-tune the construction techniques, and evaluate the effectiveness of the method.

5.5.5 *Other Areas:* Areas where large amounts of fill are not to be placed, localized areas within excavations, and other areas that still require that unstable soils be mitigated could be addressed by one of the following mitigation techniques:

- Processing to Remove Excess Moisture. With this technique, the upper 12 to 18 in. of soil is disked or aerated to process the soil and lower the moisture content. The soil is aerated by opening the ground surface and turning the soil several times a day with construction equipment. Generally, several days will be required to reduce the moisture content. Care must be taken to seal the surface in the event inclement weather is forecasted;
- Overexcavation and Backfill. With this technique, the wet, unstable soils are removed, typically to a depth of about 3 ft below the finished grade elevation and replaced with dry select fill material. The base of the excavation should be lined with a woven geotextile as specified in Table 4 to provide both separation of differing material types and reinforcement of the dry select fill; or
- Stabilization with Hydrated Lime. The near-surface silty clay and clayey silt soils at
 this site are best stabilized with hydrated lime. Preliminary estimates indicate that
 approximately 4.5% by weight (4 lbs per sq yd per in. depth) or approximately 10% by
 weight (8.1 lbs per sq yd per in. depth) of Portland cement would be required to
 stabilize the soil. The chemical stabilization would be most effective when used to
 stabilize or modify wet/unstable soils near the ground surface.

The selection of the proper mitigation method should be determined by the project geotechnical engineer at the time of construction after evaluation of the specific conditions that have been encountered.

5.6 Fill Materials

Fill material utilized at the site should be a locally-available silty clay (CL), clayey silt (ML), sandy clay (CL) or clayey sand (SC). The material should be free of roots, construction debris, organic matter or any other type deleterious matter. The fill material should have a liquid limit of less than 45 and a plasticity index between 5 and 25.

The near-surface silty clay and clayey silts present at the site and in the borrow locations are suitable for use as fill materials. However, these materials are generally at moisture contents that are significantly greater than the optimum moisture content. These materials will require processing to reduce the moisture content before they can be reused as select fill. Additionally, the limitation of excavation depths to no greater than 13 ft below the existing ground surface will limit the amount of material that can be obtained from on-site borrow pits. We anticipate that if excavations within the borrow pits extend to greater than about 13 ft below the existing ground surface elevation, hydrostatic heave and instability of the excavations will occur.

The clay (CH) soils that are present in the proposed borrow areas do not meet the plasticity characteristics recommended above for general select fill. However, these soils can be used for fill materials in the lagoon levees or as liner material for the lagoons.

5.7 Fill Placement and Compaction

Fill materials should be placed in horizontal lifts with a maximum loose lift thickness of 9 in. The first two lifts of select fill over the sand bridge lift or over a geotextile in an overexcavation and backfill situation should be compacted to at least 92% of the Standard Effort (ASTM D 698) maximum dry density. The third and fourth lifts should be compacted to at least 95% of the Standard Effort maximum dry density. Each of the remaining lifts should be compacted to at least 98% of the maximum dry density, as determined by the Standard Effort compaction

procedures. Additionally, each lift of fill materials should be free from "pumping" or yielding soils. To facilitate construction, we recommend that the fill materials be placed and compacted at moisture contents that are within the range of 4% below to 3% above the optimum moisture content as determined from the Standard Effort (ASTM D 698) compaction test.

Backfill around structures or walls that is not required to support structural loads should be compacted to at least 95% of the Standard Effort maximum dry density with stability present. Small hand compactors may be required to compact fill materials placed within confined areas or around structures. If hand compaction methods are used, the lift thickness should be reduced to about 5 in. or less to achieve the required compaction.

5.8 Consolidation Settlement Estimates

Construction at this site will require the placement of about 9 to 12 ft of compacted fill material. This amount of fill material combined with the soft/loose and wet soil conditions that are present will result in significant consolidation settlement. A total of 4 consolidation tests were performed on samples from this site to determine the consolidation characteristics of the subgrade soils. Analyses of the consolidation settlement were performed assuming the current (existing) condition and that the fill would be placed over the subgrade soils that had achieved some drainage and were in a soft to firm condition. These analyses are presented in the following paragraphs.

- 5.8.1 Current Soil/Groundwater Conditions: Analyses of the soil conditions indicate that the naturally-deposited soils within the upper 2 to 5 ft consist of loose clayey silts and soft silty clays. Additionally, there are zones of very soft silty clay and loose clayey silt present to depths that range from 10 to 15 ft below the ground surface in localized areas. Settlement estimates were made for these soil conditions assuming that 12 ft of fill would be placed over the entire site. Based on the assumption that an average of 12 ft of fill would be placed over the site and assuming the current soil/groundwater conditions, we estimate that total settlements over the site could range from 11.5 to 12.5 in. We anticipate that approximately 1.5 in. would be immediate with about 10 to 11 in. of long-term settlement expected. Estimates of time rate of settlement for this condition indicate about 220 days for 50% settlement and 2.5 years for 90% of the settlement to occur.
- **5.8.2 With Bleeder Ditches and Fill:** Provided that the bleeder ditches are cut as recommended herein and the upper portion of the soils are allowed to drain prior to construction of the fill, we estimate that total long-term settlements under the proposed fill thickness would be on the order of 5 to 7.5 in. Differential settlements between structures due to consolidation settlement of the fill material and underlying subgrade soils should be less than 1 in. The estimated time for 50% of this settlement to occur is 120 days and for 90% of this settlement should occur in approximately 18 months. Proper note should be taken that due to the variable conditions across the site, the magnitude and time required for settlements to occur could vary significantly.

Preloading of the site will assist in reducing amount of differential settlement between structures and the time required for the settlements to occur. The amount of time required for settlement under a preload is dependent upon the amount of drainage provided and the amount of additional fill placed as the preload. Assuming that the fill materials are placed with an additional 6 ft of preload, we estimate that the total settlements would be on the order of 7 to 8 in. Differential settlements between structures due to consolidation settlement of the fill material and underlying subgrade soils should be less than 1 in. The estimated time for 50% of this settlement to occur is 100 days and for 90% of this settlement should occur in approximately 14 months.

- **5.8.3 With Overexcavation and Backfill:** If the upper 3 ft of soils are overexcavated and backfilled, a portion of the softer soils that are prone to consolidation settlement should be removed and replaced with competent materials. With this scenario, we estimate that the total settlements would be on the order of 5 to 6.5 in. Differential settlements between structures due to consolidation settlement of the fill material and underlying subgrade soils should be less than 1 in. The estimated time for 50% of this settlement to occur is about 90 days and for 90% of this settlement should occur in approximately 12 months.
- 5.8.4 Preload Recommendations: In order to decrease the magnitude of the differential settlements and the time required for the majority of the settlements to occur, we recommend that the fill materials be placed to the required El. 260 with an additional thickness of soil added to preload the site. We recommend that the fill and an additional 6 ft of preload be installed and allowed to sit undisturbed for a period of 120 to 180 days to allow for the majority of the settlement to occur prior to construction of the structures. We also recommend the installation of settlement plates to monitor the rate and magnitude of settlement that has occurred. These settlement plates should be installed at critical locations within the fill and monitored periodically. We recommend that at least 15 settlement plates be installed. These plates should be installed at the proposed finished grade elevation prior to the installation of the preload soil. The plates should be read twice a week for the first three weeks then weekly thereafter. The project geotechnical engineer should monitor the progress of the settlement over the course of the preloading.
- **5.8.5 Soil Mixing Alternative:** If the soil mixing alternative of site mitigation is chosen, we anticipate that the stabilization will result in a significant reduction in the consolidation settlements. For the soil mixing alternative, we estimate total settlements in the interior portions of the fill of about 1.5 to 2 in. with maximum differential settlements on the order of about 0.75 in.

5.9 Borrow Areas

Both the West Borrow Area and the South Borrow Area should have bleeder ditches constructed that will allow drainage of the potential borrow soils prior to excavation. These bleeder ditches should extend to a depth that will place the bottom of the bleeder ditch at least 2 ft deeper than the proposed depth of borrow excavation. Construction of these bleeder ditches will require the construction of a sump and the use of pumps to evacuate the water into the adjacent creeks. Excavations within the borrow areas should not exceed a depth of about 13 ft below the existing ground surface (approximately elevation 235) due to the potential for hydraulic heaving of the excavation base.

With the current soil conditions, we anticipate that bleeder ditches greater than about 6 ft in depth will slough unless the sides are sloped. Staged construction of the bleeder ditches may be required to adequately remove the groundwater from portions of these borrow areas.

The moisture contents of the soils within the borrow areas are currently in the range of 23% to 32%. Construction of bleeder ditches will result in these moisture contents being reduced somewhat. However, additional processing of the soil will be required to reduce the moisture content to a level where the soils can be placed and properly compacted. The clay, silty clay, and clayey silt materials encountered in these borrow areas are generally at moisture contents that are significantly greater than the optimum moisture content (estimated at 16 to 18%). These materials will require processing to reduce the moisture content before they can be reused as select fill. Analyses of the soil moisture contents of selected samples from the borrow areas indicated the following:

	Soil Moist	ure Content in Bor	row Areas		
	West Bor	row Area	South Bo	rrow Area	
Depth (feet)	Moisture Content Range (%)	Required Moisture Content Reduction (%)	Moisture Content Range (%)	Required Moisture Content Reduction (%)	
0 - 5	26 - 30	10 - 14	27 - 32	11 -16	
5 -10	24 - 32	8 - 16	23 - 32	7 -15	
10-15	22	6	24 - 25	8 - 9	

This table indicates that the near-surface soils at this site are very wet, but generally show decreasing moisture contents with depth. Although the bleeder ditches will assist in reducing the amount of free water in the soil, we anticipate that significant processing and drying will be required to reduce the moisture content to a level that will allow efficient placement and compaction. Alternately, the borrow materials could be processed and chemically treated with hydrated lime or Portland cement to rapidly reduce the moisture content and improve the engineering properties of the soil for use as fill.

A significant amount of effort will be required to dewater the near-surface soils within the borrow areas and to process the soils to lower the moisture contents to acceptable levels. With these factors in mind, we recommend that the contractor be given the option of providing an off-site borrow source rather than, or in addition to, using the on-site borrow sources.

6.0 SHALLOW FOUNDATIONS

The foundations for the proposed structures could consist of shallow foundations bearing within either the dewatered natural soils or the compacted select fill materials, depending on the bearing elevation. The administration building/laboratory could be constructed with a slab-ongrade and exterior and interior grade beams supporting wall loads. Alternately, a monolithic slab and grade beam system with continuous perimeter footings and interior continuous footings beneath load bearing walls could be utilized for this structure. Column loads, if required, could be supported by spread footings. The spread footings should be structurally connected to the slab. The headworks, pump station, aeration basin, clarifiers, sludge press/digester, post aeration basin and effluent pump structures could be supported by means of a mat foundation.

Proper note should be taken that the use of a shallow foundation system assumes that the soft soil conditions at the site have been mitigated using one of the techniques discussed above. The use of shallow foundation support for these structures without proper mitigation of the soft soil conditions will result in significant settlements of the fill and structures, with possible large differential settlements between the structures.

6.1 Bearing Surface Protection

Recommendations for foundation design, as provided herein, are predicated on the assumption that the bearing soils are similar in consistency to those encountered during the investigation or that fill materials are maintained at a moisture content that will not reduce their bearing capacity. Often, construction practices and poor surface water drainage during construction can cause degradation of the bearing surface. This potentially detrimental condition should be mitigated by exercising the following precautions:

 Provide positive drainage away from the footing excavations, both during and after construction;

- Avoid footing excavations during inclement weather and place concrete in the excavations within 24 hours after completion of the excavations;
- If water is allowed to accumulate within a footing excavation and softens the bearing soils, the deficient soils should be removed from the excavation prior to concrete placement;
- Place a "mudmat" of lean concrete to seal the bearing stratum, in the event wet conditions are experienced or expected; and
- Minimize traffic in footing excavations to only that necessary to place the steel and concrete for the footings.

6.2 Bearing Stratum/Depth/Capacities

The foundations for the structures should bear either entirely within the dewatered natural soils or the compacted fill materials that are to be placed at the site. Using the bearing depth that was provided for each of the structures, the following net allowable soil bearing pressures should be used for design of the structures.

Structure	Foundation Type	Approximate Bearing Elevation	Net Allowable Soil Bearing Pressure, psf
Administration	Continuous Footing	259	2,100
Administration	Spread Footing	259	2,500
Aeration Basin	Mat	250	4,250
Clarifiers	Mat	245	4,700
Digester	Mat	236	3,900
Influent Pump Station	Mat	220	5,000
Solids Handling	Mat	259	3,900
UV Flume/Effluent Pump	Mat	250	3,900
Clarifier Splitter Box	Mat	237	3,900
Headworks	Mat	252	4,250
Influent Splitter Box	Mat	251	3,900

The bearing capacity values given above include a theoretical safety factor of about 3.0 against general bearing capacity failure in the underlying soils. The values have taken into consideration the weight of concrete and soil below grade. These net allowable bearing capacities have also considered the distance between the bottom of the foundation and the softer silty clay soils below the fill materials. These analyses have considered the strength gain that is expected due to dewatering of the site by means of bleeder ditches and consolidation of the subgrade soils beneath the weight of the fill and preload soils. Higher bearing capacities would be achieved if the soil mixing or overexcavation and backfill options were chosen to mitigate the wet/soft soil conditions.

Continuous footings for the Administration Building/Laboratory structure should have a minimum bearing width of 24 in. and the exterior footings should have a minimum bearing depth of 24 in. below the outside finished grade elevation. Interior continuous footings should have a minimum bearing depth of 12 in. below the base of the slab. Spread footings should have a minimum bearing width of 24 in. and a minimum bearing depth of 2 ft below the outside finished grade elevation. All of the mat foundations should bear near the elevation indicated in the above table. Mat foundations should have a minimum bearing depth below the exterior ground surface of 3 ft.

6.3 Uplift Capacity

Spread footings should be properly dimensioned and should bear at the depth required to adequately satisfy the design compression and uplift loading conditions. The uplift capacity of an individual spread footing should be taken as equal to the buoyant weight of the concrete in the structure plus the buoyant weight of any backfill soils lying directly over the footing. The buoyant weight of the concrete should be taken as 88 lbs per cu ft and the buoyant weight of the backfill soils should be taken as 53 lbs per cu ft provided that the soils are adequately compacted as recommended herein.

When the weight of the backfill soils is added to the weight of the structure, and then divided by the uplift force, the resulting factor of safety against uplift for the footing should exceed 1.2. The final dimensions of the foundations and foundation reinforcement should satisfy both the requirements for the compressive and uplift capacities of the footing.

6.4 Movements

Even when designed with adequate safety factors against bearing capacity failure, foundation and floor slab movements can occur. Settlements result from immediate deflection (essentially, upon load application) and consolidation (over an extended time period) in response to stress increase in the underlying soils. Some differential movement may occur due to differential settlement within the fill materials. With properly designed and constructed earthwork and foundations, the total settlements within the structures should be on the order of about 1 in. with differential settlements predicted to be less than 0.5 in. For a properly prepared site, we estimate that differential movements between structures will be less than 0.75 in. This assumes that the site is adequately drained and preloaded to reduce the long-term settlements in the soft/loose subgrade soils. Detailed results of settlement analyses are discussed in Section 5.8.

7.0 DEEP FOUNDATIONS

Auger cast or driven piles would allow for effective transmittal of the loads to the dense to very dense granular soils that are present from about 30 ft below the ground surface. The use of deep foundation systems would allow construction of the structures to begin immediately after placement of the fill and prior to the consolidation settlements occurring.

In-house computer resources were used to determine the allowable compressive capacities of auger cast and driven piles. We have provided pile capacity curves for use in the calculation of capacities, relying on adhesion (skin) resistance along the shaft/pile that should be used for design and end-bearing of the shaft/pile base. Limiting adhesion values at the shaft-pile/soil interface are based upon empirical approximations. End-bearing is based upon the classical bearing capacity theory with appropriate depth restrictions. The capacities provided herein consider failure at the pile-pier/soil interface and include a Factor of Safety of about 3.0 for both skin friction and end-bearing. We have also included a reduction in the pile capacity to account for negative skin friction acting on the pile as the soft soils around the pile consolidate.

Provisions for structural design of the reinforced concrete piles have not been made. A licensed structural engineer should perform structural design of the foundation. The following paragraphs provide design information and recommendations for installation of deep foundations.

7.1 Spacing and Group Effects

Piles should be designed to allow a center-to-center spacing of at least 2.5 diameters. Closer spacing could create installation difficulties and/or a reduction in group capacities. The axial

capacity of pile groups with this minimum spacing can be calculated as the sum of the axial capacities of individual shafts. Should the pile spacing be closer than 2.5 pile diameters, we should be contacted to provide a group analysis.

7.2 Bearing Depth

Auger cast and driven piles for these structures should have a minimum bearing depth of 35 ft below the existing ground surface. This bearing depth should place the pile tip at least 5 ft into the dense sand that is present at this site. We estimate that the bearing elevation for these piles will be between El. 213 and El. 215.

7.3 Axial Capacities

Axial capacities were computed for representative pile sizes using in-house computer resources. These analyses considered both frictional (skin) resistance along the pile and end bearing of the pile base. The frictional resistance of the upper 4 ft was neglected because of seasonal moisture variations within the soil. A reduction in the pile capacity to account for negative skin friction acting on the pile as the soft soils around the pile consolidates was also included in the analysis. Allowable compression capacities for various-size driven concrete piles and auger-drilled-cast-in-place (auger cast) piles for each of the structures are illustrated on Figures 8 through 27.

7.4 Lateral Capacities

The deep foundation components that will be required to resist the large magnitude compressive loading should be adequate to resist the lateral forces that are expected for these structures with minimal horizontal deflections. However, the near-surface soils are relatively weak, and lateral performance should be verified when the final designs are developed. Lateral load analysis of the pile foundations could be conducted by Aquaterra after the actual type, size, and length of the foundation elements are selected.

7.5 Settlements/Displacements

A beneficial effect of pile support of the structures is to transmit the loads into the underlying soils and limit settlements. Pile foundations designed and installed in accordance with the above recommendations are anticipated to undergo nominal settlement. We estimate that settlements under the design loads to be less than 1 in. when the piles are bearing within the dense sand soils present below a depth of 30 ft.

7.6 Installation and Quality Control

Installation considerations for auger cast and driven piles are significantly different. In either case, the pile installation should be monitored and documented by a representative of a qualified geotechnical engineer. Proper site preparation, construction techniques, concrete quality control, and documentation of the pile installation are critical to the integrity of the deep foundations. These construction efforts should be monitored and documented by a representative of a qualified geotechnical engineer. We recommend that the project geotechnical engineer review the foundation plans and specifications for the pile installation prior to completion. This will provide some assurance that the recommendations of this report have been met.

7.7 Load Test Considerations

The capacities and predicted deflections that have been provided for the driven pile and auger cast pile foundations should be verified through an on-site load testing program. The load testing should be performed in the area where the maximum loading conditions are anticipated and soil conditions are representative of the overall site conditions. Load testing procedures

should be performed in accordance with ASTM D 1143. It is recommended that both a tension and compression load test be performed. This will enable quantification of the skin friction and end-bearing components. Provisions should be made to test the foundation element to at least 2.5 times the design capacity or to a minimum head deflection equal to 10% of the pile diameter, whichever is greater. The predicted capacities presented in this report should be compared with the site-specific load testing information. Some revisions of the design may be necessary as a result of the load testing.

8.0 SUBTERRANEAN STRUCTURES

Construction of the pump stations and wet wells at this facility will require the design and construction of subterranean walls. Both active and passive lateral earth pressures can be used in the design of the clarifier, pump station walls, and other subterranean structures at the site.

8.1 Lateral Earth Pressure Coefficients

Based on the soil conditions at the site, the following lateral earth pressure coefficients could be used for design of the structures:

Soil Type	New Fill	Silty Clay	Silty Sand	Sand w/ Gravel
Typical Depth (ft)		0 to 23	23 to 30	30 to 50
At Rest (Ko)	0.58	0.55	0.40	0.35
Active (Ka)	0.46	0.49	0.33	0.26
Passive (Kp)	2.20	2.04	3.00	3.85

Analysis of the soil conditions indicates that a moist unit weight of about 115 lbs per cu ft is a good average and should be used for the silty clay soils present in the upper 23 ft at the site. Below about 23 ft, the sands should have a moist unit weight of about 125 lbs per cu ft and a buoyant unit weight of about 62 lbs per cu ft. Detailed analysis of shoring systems including determination of embedment depths for sheet pile walls can be provide upon your request.

9.0 SLUDGE LAGOONS

Construction of the new treatment facility will include the construction of two sludge lagoons. Each of these lagoons will be approximately 1.6 acres in size. We understand that the top of the levee will be at about El. 260 while the bottom of the lagoons will be at approximately El. 243. This bottom elevation will place the bottom of the lagoons 4 to 5 ft below the existing ground surface elevation.

Results of flexible wall permeability tests performed on selected samples from the lagoon area indicate that the in-place permeability of the clayey silt and silty clay soils ranges from 2.1×10^{-6} to 4.8×10^{-7} cm/sec with an average permeability of 1.03×10^{-6} cm/sec. Results of these permeability tests are shown on the soil boring logs in Appendix A along with the classification data.

10.0 GRAVITY SEWER

We understand that the sewer line serving the new WWTF will be a 54-in. diameter line that is located 15 to 20 ft below the ground surface. Boring B-58 was located approximately 1.6 miles north-northeast of the plant site on the proposed alignment of the gravity sewer. This soil boring

encountered loose to medium clayey silt (ML) overlying stiff silty clay (CL). Free groundwater was encountered at a depth of about 13 ft below the ground surface.

Based on this one boring, it appears that the sewer line will bear within the stiff silty clay. These silty clay soils should provide reasonable bearing soils for the proposed sewer. We anticipate that groundwater conditions will require that open excavations be dewatered. Proper note should be taken that the alluvial deposits in this area can change significantly along the proposed alignment.

11.0 CONSTRUCTION DOCUMENTATION

The success of this project requires good earthwork quality control and the involvement of the geotechnical engineering firm of record. Field density tests should be performed on each lift of the backfill materials to provide assurance that adequate and uniform densities are being obtained. Continuous inspection of earthwork activities should be performed by an engineering technician from Aquaterra Engineering, LLC working under the direction of a registered professional engineer. This inspection would provide some assurance that construction activities are being performed in accordance with these recommendations and the project specifications. This work should be performed by Aquaterra Engineering, LLC for the owner.

Recommendations have been made in this report, which provide the conditions required for the design recommendations that are provided. Failure to comply with these recommendations can result in construction difficulties and unsatisfactory foundation performance. The following construction monitoring program is recommended in order to document compliance with the recommendations:

- Observation of final site clearing, as well as mitigation procedures, and undercutting;
- Verification of the acceptability of proposed fill sources;
- Observation of fill import, placement, and compaction;
- Testing of each compacted lift to verify stability and acceptable moisture content and dry density conditions;
- Observation of the foundation bearing surface prior to placement of reinforcing steel or concrete; and
- Testing of concrete to be used for foundations to document proper slump, compressive strength and curing conditions.

This construction monitoring program should be performed by a representative of Aquaterra Engineering, LLC under contract to the owner.

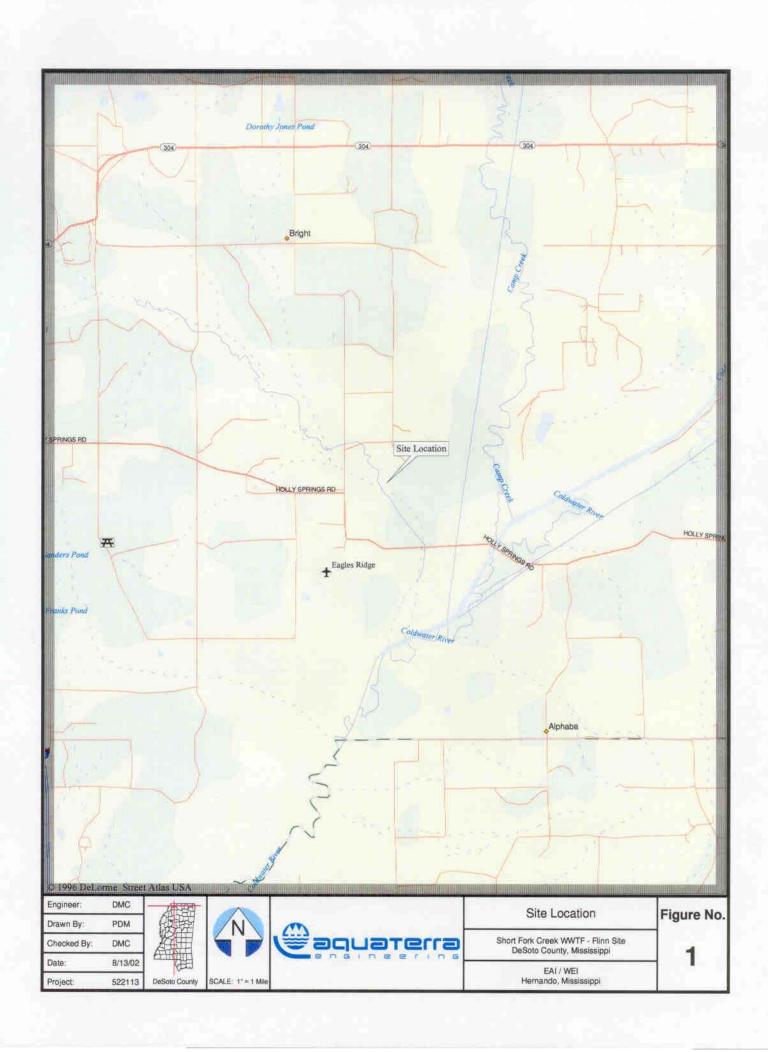
12.0 CONSULTATION AND LIMITATIONS

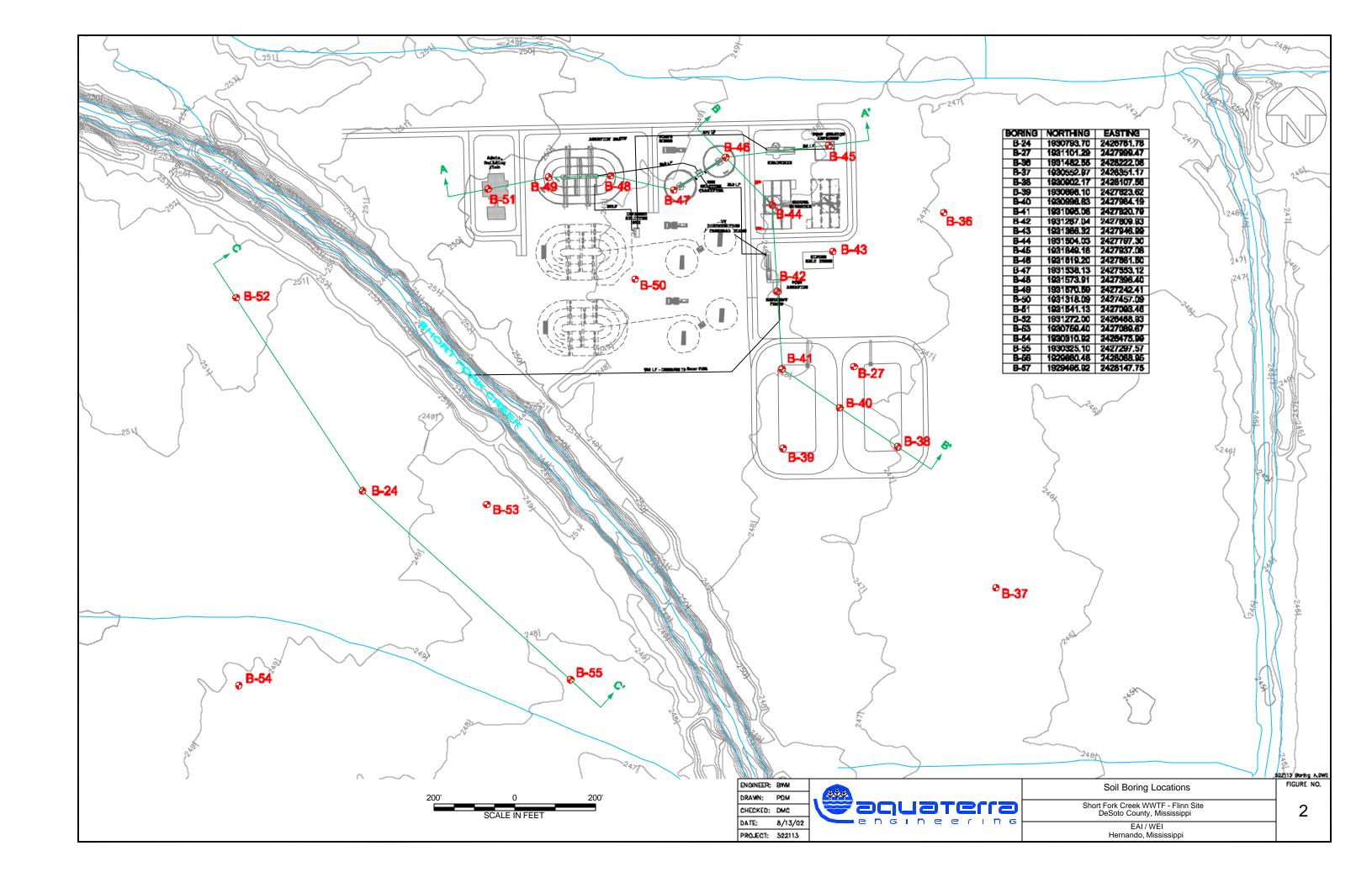
This report is provided to transmit our findings and recommendations regarding this project. Often, during the review of this report, during final design or during construction, questions may arise which require further review of site conditions, clarification of the recommendations provided in this report, or development of more specific recommendations. We recommend a brief telephone call or conference to resolve any questions or needs for clarification of the recommendations presented in this report. Additionally, we recommend that the project geotechnical engineer review the project plans and specifications during the final stages of the design process to help assure that the recommendations of this report have been met.

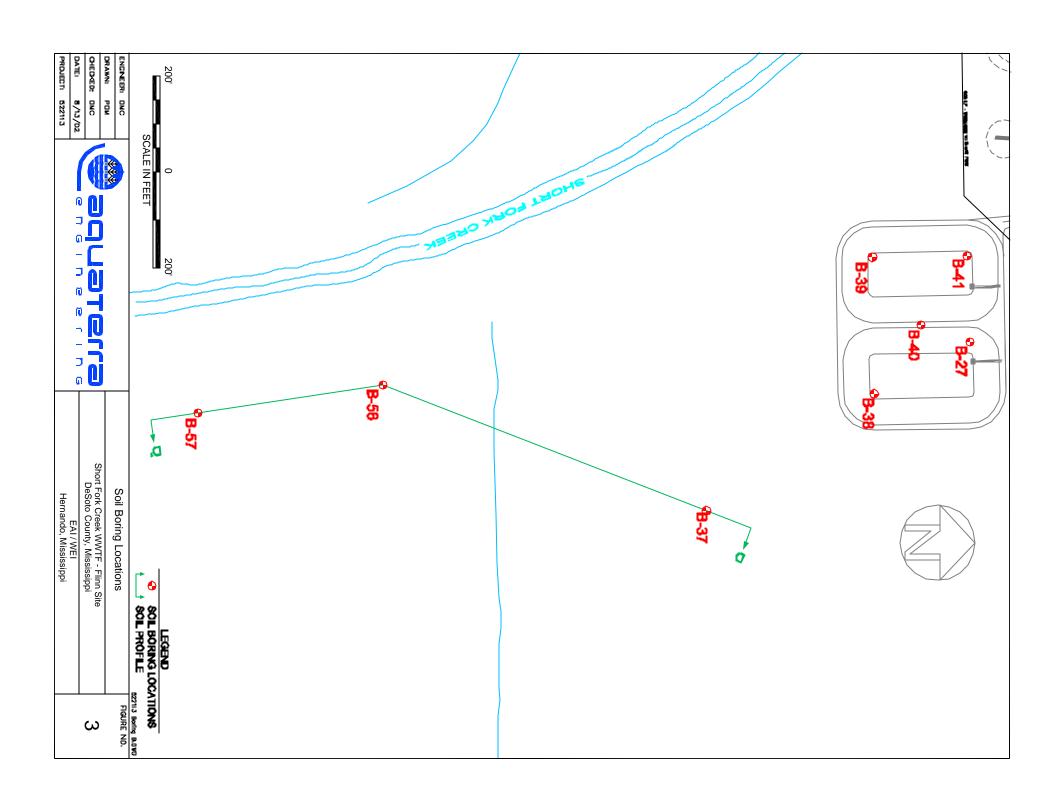
These analyses and recommendations are based upon the assumption that the soil borings made for this investigation represent the soil and groundwater conditions throughout the site. Variations may occur away from the boring locations. If conditions different from those described in Section 3 are encountered or are expected, this office should be promptly notified so that effects of the varying conditions can be determined and any necessary changes to these analyses and recommendations can be made.

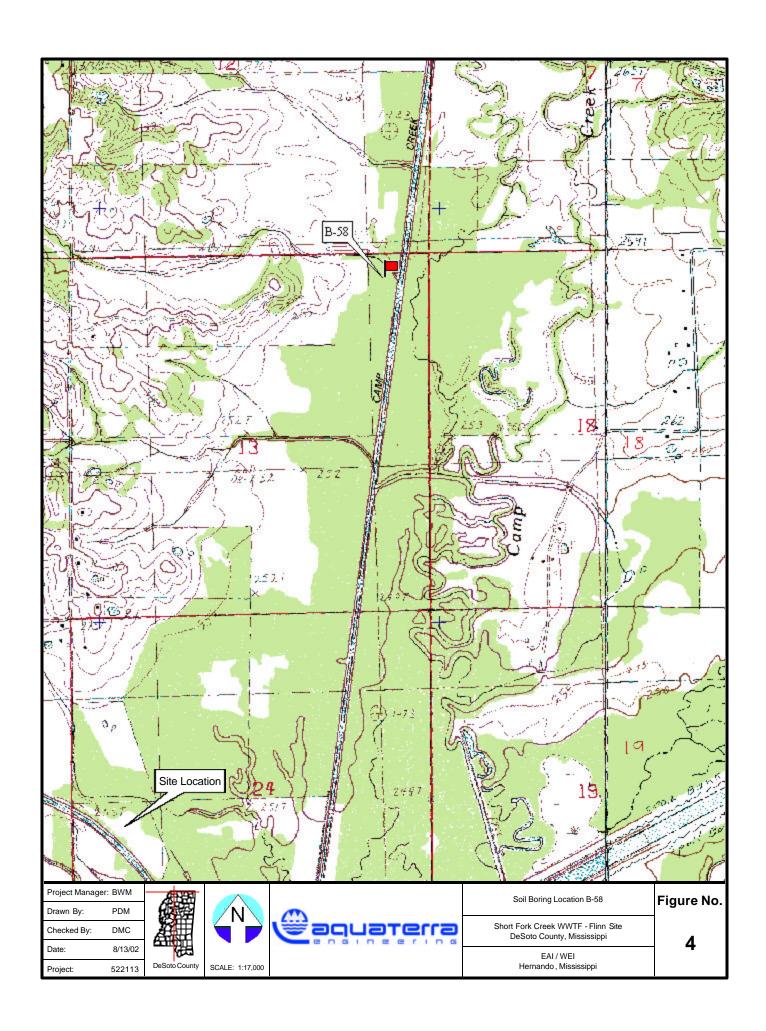
This investigation program and these recommendations are intended for specific application to the project generally described in Section 2, at the site described in Section 3. The data or the analyses and recommendations presented in this report are not necessarily applicable for any other project or location. If the nature of the project should change from the descriptions provided in Section 2, these recommendations should be reevaluated.

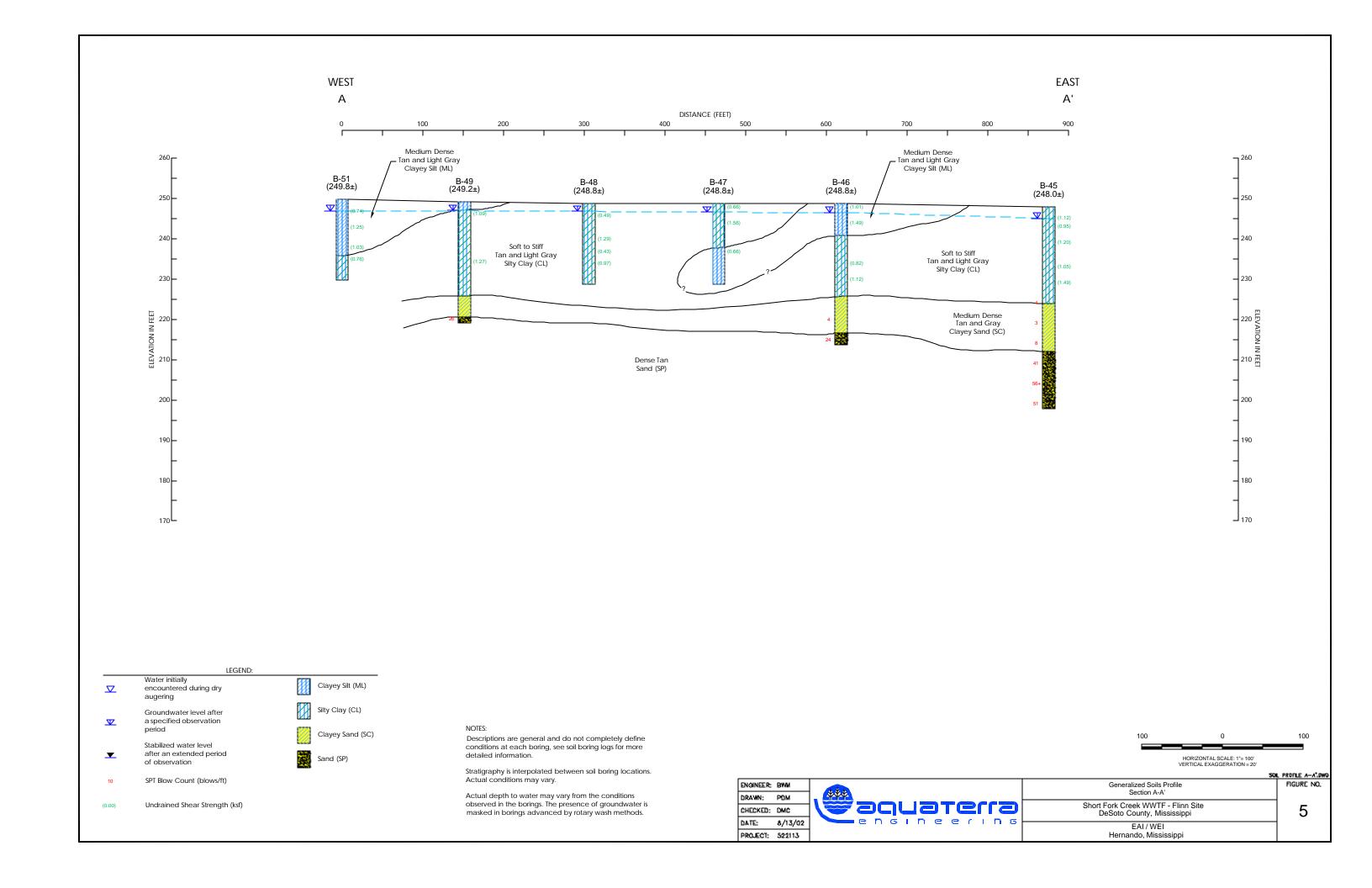
The only warranty made in connection with the services provided is that we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty is expressed or implied.

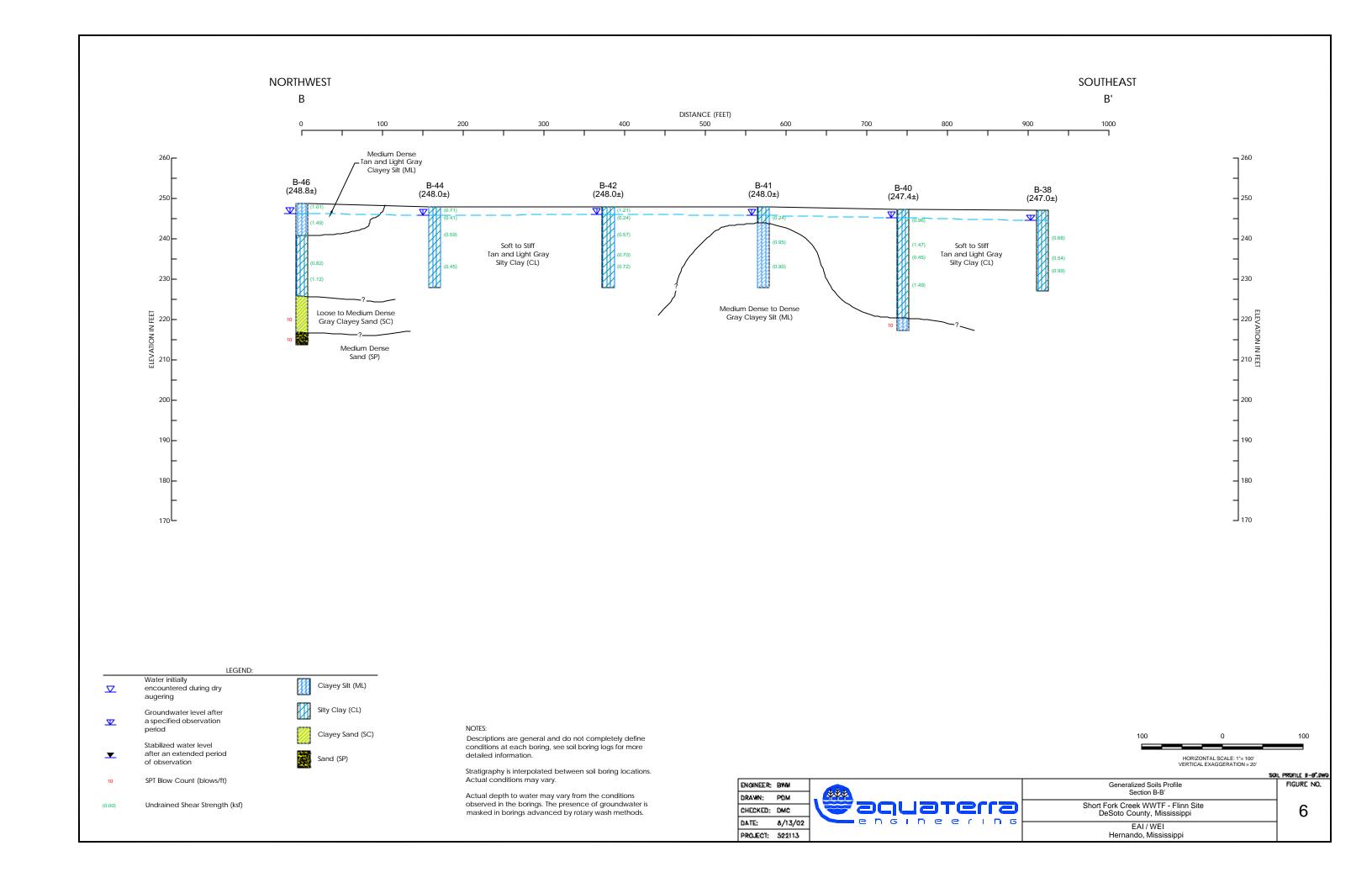


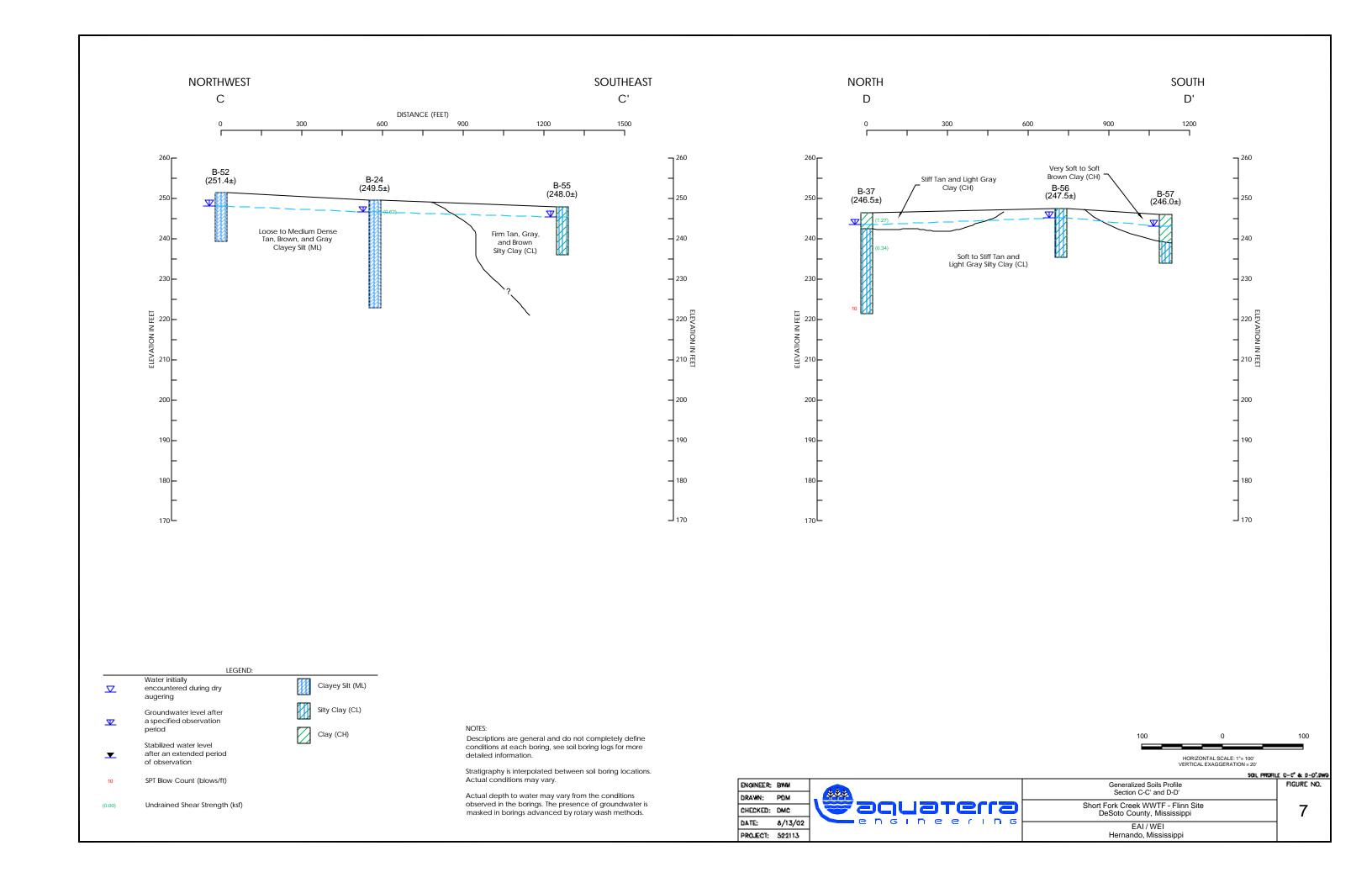












APPENDIX A

FIELD and LABORATORY PROCEDURES

SOIL BORING LOGS

SOIL BORING LEGEND

TERMS USED ON SOIL BORING LOGS

GRAIN SIZE CURVES

This geotechnical investigation was conducted utilizing standard procedures developed by Aquaterra Engineering, LLC for investigations of this nature. The following paragraphs describe the field and laboratory procedures utilized. Soil boring logs that provide data collected and a description of soil and groundwater conditions are also included. The appendix also provides legends that describe the terms and symbols used in the boring logs.

FIELD INVESTIGATION

The field investigation was conducted during the periods May 23, 2002, June 4, 2002, and July 25 through 30, 2002. It included a site reconnaissance to document site characteristics pertinent to the geotechnical investigation and the conduct of a soil exploration program. An Aquaterra engineering technician documented the information collected during the field investigation.

Site Reconnaissance

The engineering technician walked the project site and documented observations that are of significance to the geotechnical investigation. Such observations include topography, vegetation, trees, drainage, other structures, surface soil conditions, and trafficability. These observations were reported to the project engineer in the form of field notes. The project engineer reviewed the results of the field reconnaissance with the engineering technician.

Soil Borings

Four preliminary borings and seventeen additional soil borings were advanced using an all-terrain vehicle-mounted soil boring rig at the locations shown on Figures 2 and 3. Four borings had been performed previously at various locations on the site. These boring locations are also shown on Figures 2 and 3. The locations of the borings had been previously staked by representatives of EAI/WEI.

<u>Soil Boring Advancement</u>. The soil borings were advanced by rotating a 6-in. diameter, short-flight earth auger with the drilling rig, removing the auger from the boring, and cleaning the cuttings from the auger before sampling or reinserting the auger into the boring. This technique allowed for the observation of soil cuttings and description of soil conditions encountered. This dry auger technique also allowed detection of free groundwater within the boring.

<u>Soil Sampling.</u> The soil sampling program included the collection of both disturbed and undisturbed soil samples. Relatively undisturbed samples were obtained by pushing a 3-in. diameter, Shelby tube sampler a distance of 2 ft into the soil in general accordance with ASTM D1587. Depths at which these undisturbed samples were obtained are indicated by a shaded portion in the "Samples" column of the attached boring logs.

After the Shelby tube was removed from the boring, the sample was carefully extruded in the field and visually classified. Relative strength estimates of the sample were obtained by penetrometer readings. These penetrometer readings in units of tons per square ft are indicated by the symbol "(P)" in the "Field Test Results" column of the boring logs. Disturbed portions of the sample were discarded and the undisturbed sample was placed in a protective container for transportation to the laboratory.

In more granular conditions, the standard penetration test (SPT) was performed. The SPT is accomplished by driving a 2-in. OD split-spoon sampler a distance of 18 in. into the soil with blows from a 140-lb hammer falling a distance of 30 in. (ASTM D 1586). Depths at which split-spoon samples were taken are indicated by two crossed slashes in the "Samples" column of the boring logs. The number of blows required to drive the sampler for each 6-in. increment was

recorded. The penetration resistance is the number of blows required to drive the split-spoon sampler the final 12-in. of penetration. Information related to the penetration resistance is presented in the "Field Test Results" column of the boring logs as the number of blows per foot (bpf).

Auger samples were also taken to allow collection of soils for classification purposes only. In this case, the sample was retrieved directly from the auger being used to advance the boring. The auger sample was placed in a glass jar to minimize moisture loss during transport to the laboratory. Depths at which these auger samples were obtained are indicated by a vertical line in the "Samples" column of the attached boring logs.

<u>Groundwater Observations.</u> During the soil boring advancement and sampling operation, observations for free groundwater were made. Information regarding water level observations is recorded in the "groundwater" column on the soil boring logs. Where free water was encountered, the depth of this observation is noted in that column as an open triangle. After encountering free water, boring operations were suspended for several minutes to allow the water level to rise and stabilize in the bore hole. The water level was again recorded and is illustrated on the attached boring logs as a triangle containing a vertical line.

<u>Boring Abandonment.</u> Upon completion of the field investigation phase of this study, all borings less than 25 ft in depth were sealed with soil cuttings. Borings 25 ft in depth or deeper were sealed with a cement-bentonite grout in accordance with Mississippi Department of Environmental Quality regulations.

LABORATORY TESTING

The soil samples were delivered to the Aquaterra laboratory for testing. The project engineer reviewed the soil boring logs developed in the field and assigned laboratory testing on select samples to provide the data necessary for the anticipated designs.

Laboratory testing was accomplished to determine index and strength properties of the soils encountered. These procedures are discussed below.

Index Properties

Moisture Content. Moisture content tests were performed to better understand the classification and shrink/swell potential of the soils encountered. The moisture content is the ratio of the weight of water in the sample to the dry weight of the sample. These tests were performed in general accordance with ASTM D 2216. The results of these tests are tabulated within the Laboratory Data section of the attached boring logs.

Atterberg Limits. Liquid limit (LL) and plastic limit (PL) determinations were performed to assist in classification by the Unified Soil Classification System (USCS). These tests were performed in general accordance with ASTM D 4318. This test determines the moisture content at which the soil begins to act as a viscous liquid (liquid limit) and the moisture content at which the soil changes from a plastic state to a semi-solid state (plastic limit). The plasticity index (PI) was calculated as LL - PL for each Atterberg limit determination. The results of these tests are tabulated within the Laboratory Data section of the attached boring logs.

<u>Grain Size Determinations.</u> Selected granular soil samples were tested to determine the particle gradation to aid in classification and to further understand the engineering characteristics. These tests were performed in accordance with ASTM D 422 and ASTM D 1140. The boring logs indicate the percent of the soil particles passing the No. 200 sieve (percent fines) in the "Percent Fines" column. Grain size curves are presented in Figure A-1.

Strength Tests

<u>Unconfined Compression</u>. The undrained shear strength of selected undisturbed soil samples was determined by means of unconfined compression tests (ASTM D 2166). In an unconfined compression test, a cylindrical sample of soil is subjected to a uniformly increasing axial strain until failure develops. For purely cohesive soils, the undrained shear strength, or cohesion, is taken to be equal to one-half of the maximum observed normal stress on the sample during the test

The results of the undrained shear strength values determined from the results of the shear strength tests are presented within the Laboratory Data section of the attached boring logs. Also shown are the natural water contents and unit dry weights determined as a part of each unconfined compression test.

<u>Triaxial Compression</u>. The undrained shear strength of selected undisturbed soil samples was determined be means of unconsolidated-undrained (UU) triaxial compression tests (ASTM D 2850). The UU triaxial test determines the shear strength of cylindrical soil samples that have been confined under fluid pressure. The confining pressures allow for the development of the friction component of shear strength, thereby yielding higher shear strengths in granular soils. Additionally, the confining pressures allow testing of weak soils that cannot be tested by the unconfined compression test.

The results of the undrained shear strength values determined from the results of the shear strength tests are presented within the "Undrained Shear Strength" column of the Laboratory Data section on the attached boring logs. Also shown are the natural water contents and unit dry weights determined as a part of each triaxial test.

Consolidation Tests

The rate and amount of consolidation with load were determined in the laboratory by the onedimensional consolidation test (ASTM D 2435). In this test, a laterally confined soil is subjected to successively increased vertical pressures, allowing free drainage from the top and bottom surfaces. The amount of consolidation with each successive load increment is recorded and the results plotted as a graph of strain versus vertical stress. Results of these tests are presented in the form of Consolidation Curves at the end of this Appendix.

Permeability Tests

<u>Flexible Wall Permeability</u>. The vertical permeability (k) of selected samples was determined using the flexible wall, or triaxial, permeability test in accordance with ASTM D 5084. In this test, the soil specimen is surrounded with a rubber membrane and subjected to an all-around confining pressure approximately equal to the in-situ confining pressure. The sample is saturated, under pressure, and when completely saturated, a hydraulic head introduced across the sample. Periodic measurements of the inflow and outflow are used to calculate the hydraulic conductivity, or coefficient of permeability, using Darcy's Law. The results of these tests are provided in the appropriate column of the soil boring logs.

PROJECT: Geotechnical Investigation

No. B-24

FILE: 522113

Short Fork Creek WWTF Flinn Site DeSoto County, Mississippi

SHEET 1 OF 1

DATE: 05/23/02 DRILLER:

CLIENT: EAI/WEI TECH.: C. Dawkins

R. Warren

ENGINEER: B. Martin Jackson, Mississippi

			DATA			L	ABORA	ATORY DATA		LAT: 34 48' 23.6 N LONG: 89 53' 58.0 W Location: N: 1930793.7 E:	
Danth		Groundwater Level	Field	Undrained	Unit W	Veight		Natural Moisture Content and Atterberg Limits	icity	2426780.3	
Depth (feet)	Samples	wpur =	Test Results	Shear Strength	- 1	_	Other	Plastic Moisture Liquid Limit Content Limit	Plasticity Index	Surface Elevation: 249.5 ±	
(icci)	Sam	Grou	Results	(ksf)	Moist	Dry		20 40 60 80	PI	DESCRIPTION	
			0.7 (T)					- + - - ◆ - - + - - + - - + -		Loose tan clayey silt (ML)	
			0.4 (T)	0.040	447			$-+- \frac{30}{2532} -+- -+- $	_		
			0.4 (1)	0.616	117	91		- + - 28 - - + - - - - - - - - - - - - - -	7		
5 -			0.5 (T)								
		-	0.5 (T)								
		-	0.9 (T)							- medium dense below 8'	
10 -		-	0.5 (1)								
		-	0.9 (T)								
		-									
15 -			0.7 (T)								
		-									
		-									
20 -		_	0.7 (T)								
20								-++		- blue from 21' to 22'	
										- very loose and dark gray with organics, sand pockets and wood below 22'	
	M	-	wон							pockets and wood below 22'	
25 -		-									
	-									Boring Terminated at 26.5'	Ť
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50 -	Gro	und	water Level	Data			Δ	dvancement Method		STRATA BOUNDARIES MAY NOT BE EXACT Notes	
			incountered		0'	-6' Sho	ort-flight /	Auger		Notes	
			' 8" after 15		6'	- 26.5'	- Rotary	Wash			
			el at 3' 11" a		5			handanaan the U. J.			
	- wil	J 10 V	5.6.5 11 6	uuy		ement/	Bentonit	bandonment Method e Grout			
							Somonic	3 3.040			
										√₩aouaterra	

PROJECT: Geotechnical Investigation

No. B-27

522113

Short Fork Creek WWTF Flinn Site

SHEET 1 OF 1

05/23/02

DeSoto County, Mississippi

DRILLER: R. Warren TECH.: B. Martin

FILE:

DATE:

CLIENT: EAI/WEI

FNGINFER: B Martin

		Jackson, I	Mississippi						ENGINEER: B. Martin
FI	ELC	DATA			L	.ABOR/	TORY DATA		LAT: 34 48' 25.8 N LONG: 89 53' 44.1 W
	Samples Groundwater		Undrained	Unit V	Veight		Natural Moisture Content and Atterberg Limits	×	Location: N: 1931101.3 E: 2427999.5
Depth	les	Field Test	Shear	(pe	cf)	Other	Plastic Moisture Liquid	Plasticity Index	Surface Elevation: 247.5 ±
(feet)	Samples Groundw	Results	Strength (ksf)	Moist	Dry		 	PI	DESCRIPTION
	S O						20 40 60 80		Firm tan and light gray silty clay (CL)
	V	1.2 (T)					-+- 1 -+- -+- -+	14	
		0.9 (T)					-+	4	Medium dense tan and light gray clayey silt (ML)
5 -	H	0.7 (T)					- + - 2 7 + - - + - - + - - + -	1	- loose below 4'
<u> </u>	H						19.28]	
		0.5 (T)	0.772	121	97		25	- 9	- wet at 6' Firm tan and light gray silty clay (CL)
		0.8 (T)]	
10 -	-	(1)						-	
		1.0 (T)						_	
	4	1.0 (1)					-+++++	7	
45								+	
15 -		1.2 (T)							
								-	
		1.1 (T)						_	
20 $+$	4	1.1(1)						4	
_							-++	-	
]	
		0.6 (T)						-	Daving Tayrein at a d of OF
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								-	
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35 -								_	
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40 -							- + + - - + - - + - - - - - - - - - - - - -		
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45 -							 -+- -+- -+- -+- -+	+	
							<u> </u>	-	
50 -]	
	- Irour	dwater Leve	 Data			Λ.	dvancement Method		STRATA BOUNDARIES MAY NOT BE EXACT Notes
				0'	-4' - S	hort-flight			110100
		Encountered		4'	- 25' -	Rotary W	ash		
✓ St	tatic I	evel at 1' 8" a	after 2 days						
						Al	pandonment Method		
				Ce	ement	/ Bentonit	e Grout		
				1					
									√ ₩ aquaterra

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

No. B-36

SHEET 1 OF 1

FILE: DATE: 522113

DRILLER: R

6/04/02 R. Warren

TECH.:

C. Dawkins

CLIENT: EAI/WEI

Jackson, Mississippi

ENGINEER: C. Dawkins

ENGINEER: D. Coleman

				/lississippi								ENGINEER: D. Coleman	
F			DATA			L	ABORA	TORY DATA				LAT: 34 48' 30.6N LONG: 89 53' 41.3 W Location:	
Depth	,	Groundwater Level	Field	Undrained Shear	Unit W	Veight cf)			berg Limits	ent	Plasticity Index		
(feet)	Samples	el el	Test Results	Strenath			Other		isture ntent	Liquid Limit	Plas	Surface Elevation: 246.8 ±	- !
	Sar	E g		(ksf)	Moist	Dry		20 40	60	80	PI	DESCRIPTION	
		-	.500 (T)	0.393	116	87		- + - 1 2 + - - - + - 1 3 + -	+55 -+		31	Soft tan and light gray clay (CH) - with ferrous nodules	
		-							+- -+	 - + -		- wet seam encountered at 3'	
5 -			1.300 (T)						<u> </u>			Firm tan and light gray silty clay (CL)	
								F					
			.700 (T)	0.512	122	98		- -21 29 - -	† -i - † :	i-i-	8	- with sand seams below 8'	
10 -		-	,	0.0.2				-+	+- -+		•		
	1							- + - - + - - - + - - + - -	+- -+	 			
		_	1.300 (T)					- + - - + - -	+ - - + ·	- $ +$ $-$		- stiff below 13'	
15 -		_	1.300 (1)						Ţ IJ Ţ Ţ]_[-			
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20			1.400 (T)						<u> </u>	-i	1		
20 -	П	_						- +	+- -+	 	1		
								-+	+- -+		1		
	1/	-							<u> </u>	<u> </u>		Medium dense brown and dark gray clayey silt	
25 -	Н	-							+		1	(ML)	
									T				
									++	- - -	1		
30 -								-++	+ - - + -		<u> </u>	Medium dense gray sand (SP)	
								-+	+- -+		1	Boring Terminated at 30'	
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			water Level		0'	- 25' -		dvancement Meth ght Auger	iou			Notes	
			ncountered ' 2" after 15		25	5' - 30'	- Rotary	Wash					
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												engineerin	6

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

No. B-37

FILE: 522113

SHEET 1 OF 1

DATE: DRILLER:

6/04/02

TECH.:

R. Warren C. Dawkins

CLIENT: EAI/WEI

	151		Jackson, N DATA	/lississippi			ABOD/	ATORY DAT	ΓΛ			ENGINEER: D. Coleman LAT: 34 48' 21.4N LONG: 89 53' 39.8 W	
D 11		Groundwater C	Field	Undrained Shear	Unit V	Veight		Natural	Moisture Contacterberg Limits Moisture		Plasticity Index	Location:	
(feet)	Samples	sround evel	Test Results	Strength (ksf)	Moist	Dry	Other	Limit — — — -	Content	Liquid Limit	PI BI	Surface Elevation: 246.5 ± DESCRIPTION	
			.400 (T)	1.270	115	88		- + - 1 3 1 - + - 1 3 1	10 60 	80 	26	Stiff tan and light gray clay (CH) - with ferrous nodules - moist with topsoil (6") at surface	
5 -		-	1.400 (T)					23		- - - - - - - -	-	Firm tan and light gray silty clay (CL)	
10 -		-	.500 (T)	0.344	121	94		- + 18 29 - - + 1 29 - - + + -			11	- soft below 8'	
			.900 (T)					- + - • + 24 + - + - - + -	-	- - - -	-	- firm below 11'	
15 -		-	.900 (T)										
20 -		-	1.000 (T)					- + - • + - - + - - + -	-+- -+ -+- -+	- -			
			22h/f						 			Medium dense gray silty sand (SP)	
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50 -								<u> </u>	<u> </u>			STRATA BOUNDARIES MAY NOT BE EXACT	
			vater Level		C.	251		dvancement M	lethod			Notes	
∑ In ∑ F			ncountered 3'	at 3' 6"	25	- 25 - 5' - 30'	- Rotary	ght Auger Wash					
					_			oandonment M	lethod				
					Ce	ement	Bentonit	e Grout				@aquaterra	.

SOIL BORING LOG No. B-38 PROJECT: Geotechnical Investigation FILE: 522113 Short Fork Creek WWTF Flinn Site DATE: 7/25/02 SHEET 1 OF 1 DeSoto County, Mississippi DRILLER: R. Warren TECH.: C. Dawkins CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 24.9N LONG: 89 53' 42.7W FIELD DATA LABORATORY DATA Location: Natural Moisture Content Groundwater Level Unit Weight Undrained and Atterberg Limits Field (pcf) Soil Type Depth Shear Samples Plastic Moisture Liquid Other Strength Surface Elevation: 247.0 ± Limit Content Limit (feet) Results (ksf) Moist Dry **DESCRIPTION** ΡI 80 40 Soft tan and light gray silty clay (CL) 0.50 (P) 30 31 - firm below 2' 90.6(3)(4) 2.00 (P) 5 2.00 (P) $0.676^{(1)}$ 0.50 (P) 122 96 10 0.50 (P) 10 0.540(2) 0.50 (P) 120 92 15 15 1.50 (P) 0.994 122 98 20 1.00 (P) 20 Boring Terminated at 20' 25 30 35 40 45 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 4': Short-flight Auger (1) UU Triaxial Compression Test performed at 6 psi Initially Encountered at 3' 4' - 20': Rotary Wash Confining Pressure Rise to 2' 6" after 15 Minutes (2) UU Triaxial Compression Test performed at 10 psi Confining Pressure (3) Percent Passing No. 200 Sieve Abandonment Method (4) Flex Wall Permeabilty = 4.8 x 10⁻⁷ Cement/Bentonite Grout AQ LOG

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

No. B-39

FILE: 522113

SHEET 1 OF 1

DATE: 7/25/02 DRILLER: R. Warren

TECH.: C. Dawkins ENGINEER: D. Coleman

CLIENT: EAI/WEI

Jackson, Mississippi

			DATA			L	ABORA	ORY DATA			LAT: 34 48' 24.8N LONG: 89 53' 46.1W Location:	
Depth	Samples	/ater	Field	Undrained	Unit W	/eight		Natural Moisture Con and Atterberg Limit	tent s	Plasticity Index		
(feet)	nples :	e nu	Test Results	Shear Strength			Other	Plastic Moisture Limit Content	Liquid Limit	Plas	Surface Elevation: 247.8 ±	- H
. ,	San	Fé g	rtoduito	(ksf)	Moist	Dry		20 40 60	80	PI	DESCRIPTION	
			0.50 (P)				99.3(2)(3)	+ - 		9	Soft tan and light gray silty clay (CL)	
	7	Y	1.00 (P)	0.603	117	91		· + - - - - + - - + · + - - * - - + - - +	· - · -		- firm below 2'	
5 -			4.50 (P)					$+ - -\frac{29}{4} - - + - - +$		1		
5												
			1.00 (P)					·	· - - - · - - -			
40			3.50 (P)	0.732	123	98		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		15		
10 -								· + - - + - - + - - + · + - - + - - + - - +	· - - -		yeny ooft helpy 11!	
			0.50 (P)	0.293 ⁽¹⁾	120	92		+- -***********************************			- very soft below 11'	
								+ -20 31	<u> </u> - <u> </u> -		- firm below 14'	
15 -			1.00 (P)	0.991	121	96			·	11	- IIIII BCIOW 14	
								-		-		
			2.00 (P)						. 			
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			vater Level		0'	- 4': 5	Ac Short-fligh	ancement Method			Notes (1) UU Triaxial Compression Test performed at 10	psi
		-	ncountered ' 4" after 15		4'	- 20':	Rotary W	sh			Confining Pressure	
<u>_v</u> Ի	/ISG	ι υ Ζ΄	+ aller 15	wiiiutes							(2) Percent Passing No. 200 Sieve (3) Flex Wall Permeability = 2.1 x 10 ⁻⁶	
					· ·	ment	At Bentonite/	ndonment Method				
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											\ ₩aquaterra	



PROJECT: Geotechnical Investigation

EAI/WEI

CLIENT:

AQUATERR.GDT

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

No. B-40

SHEET 1 OF 1

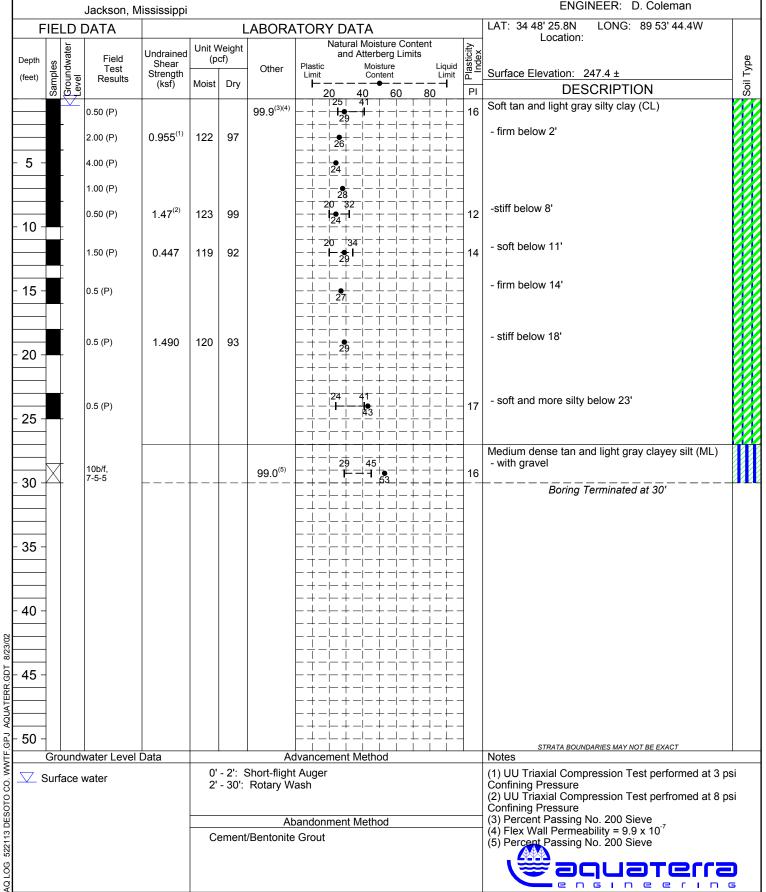
FILE: 522113

DATE: 7/25/02

DRILLER: R. Warren C. Dawkins

TECH .:

ENGINEER: D. Coleman



PROJECT: Geotechnical Investigation

Investigation

No. B-41SHEET 1 OF 1

FILE: 522113

Short Fork Creek WWTF Flinn Site DeSoto County, Mississippi

DATE: 7/25/02
DRILLER: R. Warren

C. Dawkins

TECH.:

CLIENT: EAI/WEI

			Jackson, N DATA			- 1	ADODA	TOD	V D/	Λ Τ /	.					LAT: 34 48' 26.8N LONG: 89 53' 46.1W
			JATA		Unit W		_ABORA		Natur	al M	oistur	e Cor	ntent		<u>ج</u>	Location:
Depth	ျွ	Groundwater Level	Field	Undrained Shear	(po	of)		Plastic	and	d Atte	erber Ioistur	g Limi	ts	iauid	Plasticity Index	
(feet)	Jple	onnd /el	Test Results	Strength (ksf)	Moist	Dry	Other	Limit		_ 'č	Conten	nt — —		iquid Limit	Ba	Surface Elevation: 248.0 ±
_	Sal	P. Q.		(KSI)	IVIOIST	ыу		1 2	20 24	40		60	80		PI	DESCRIPTION
							99.7 ⁽¹⁾⁽²⁾	-+-	24 9 -	- +	- + -	-		-	17	Very soft tan and light gray silty clay (CL)
		- <u>V</u>		0.239	115	91		-+-	· - <u>-</u> · -	_ -	- + - - ⊥ -	-		-		
		-		0.239	113	91		<u> </u>	27 2428	_	_	1		-		Medium dense tan and light gray clayey silt (ML)
5 -								<u> </u>	23	_ -	_	_ _	_	-	4	i wedium dense tan and light gray dayey siit (WL)
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10 -		_		0.950	123	98			26	_ -	- † -	-				
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		_							22 +	_ -	- + - - + -	-	-	- - -	6	
		-						<u> </u>	Ė į	_ <u> </u> _	- <u>†</u> -	-		- <u> </u> -	-	
15 -				0.900	122	98		<u> </u>	25	- -	- + -	_ _		-	1	
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	Gro	oundy	vater Level	Data			Ac	dvance	ment	Met	thod					STRATA BOUNDARIES MAY NOT BE EXACT Notes
V F	First	t Enc	ountered at	3'6"	0'	- 4': 5	Short-fligh	t Augei	r							(1) Percent Passing No. 200 Sieve (2) Flex Wall Permeability = 5.35 x 10 ⁻⁷
			' 3" after 15		4	- ∠0′:	Rotary W	asn								(2) Fiex vvali Permeability = 5.35 X 10
							ΛL	anda:-	mont	1/1~	thad					
					Ce	ement	At Bentonite/	andon Grout		ivie	uiod					
							. 20.11011110	. 0.000								
																engineering

SOIL BORING LOG No. B-42 FILE: PROJECT: Geotechnical Investigation 522113 Short Fork Creek WWTF Flinn Site DATE: 7/25/02 SHEET 1 OF 1 DeSoto County, Mississippi DRILLER: R. Warren TECH.: C. Dawkins CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 29N LONG: 89 53' 46.3W FIELD DATA LABORATORY DATA Location: Natural Moisture Content Groundwater Level Unit Weight Undrained and Atterberg Limits Field (pcf) Soil Type Depth Shear Samples Plastic Moisture Liquid Other Strength Surface Elevation: 248.0 ± Limit Content (feet) Results (ksf) Moist Dry **DESCRIPTION** ΡI 80 Stiff tan and light gray silty clay (CL) 1.50 (P) 1.210 117 89 13 - very soft below 2' $0.238^{(1)}$ 0.50 (P) 112 82 - firm below 4' 5 2.00 (P) 1.50 (P) 0.570 122 96 11 3.00 (P) 10 0.50 (P) 0.703 121 95 12 15 1.00 (P) 0.719 122 95 15 1.00 (P) 20 Boring Terminated at 20' 25 30 35 40 45 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 4': Short-flight Auger (1) UU Triaxial Compression Test performed at 3 psi First Encountered at 3'6" 4' - 20': Rotary Wash Confining Pressure Rise to 1' 10" after 15 Minutes Abandonment Method Cement/Bentonite Grout

522113 DESOTO CO. WWTF.GPJ

P00

PROJECT: Geotechnical Investigation

No. B-43

FILE:

Short Fork Creek WWTF Flinn Site

SHEET 1 OF 1

DATE: 7/25/02
DRILLER: R. Warren

DeSoto County, Mississippi

CLIENT:

TECH.: C. Dawkins

522113

EAI/WEI
Jackson, Mississippi

ENGINEER: D. Coleman

F		DATA			L	ABORA	ATORY DATA LAT: 34 48' 29.7N Location: Location:	
Depth	Samples Groundwater	Field	Undrained	Unit W	Veight		Natural Moisture Content and Atterberg Limits	a
(feet)	Samples	Test Results	Shear Strength			Other	Natural Moisture Content and Atterberg Limits Plastic Moisture Liquid Limit Content Limit Surface Elevation: 247.7 ±	Lio?:
	San	T TOOGILO	(ksf)	Moist	Dry		20 40 60 80 PI DESCRIPTION	i.
		7 1.50 (P)					Firm tan and light gray silty clay (CL)	
		0.50 (P)	0.828	121	95		1229	
- 5 -		2.50 (P)						
		1.50 (P)	0.760	123	99		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
	₽		0.760	123	99			
- 10 -		0.50 (P)						
		1.00 (P)	0.474	121	93		Soft tan and light gray silty clay (CL)	
		(,)	0.171				- + 30 + + + - · · ·	
- 15 -		1.50 (P)					- firm below 14'	Ø
		2.00 (P)						
- 20 -		2.00 (P)	L				Boring Terminated at 20'	<i>- 100</i>
							- + + + + +	
- 25 -							├─┼─ ├─┼─ ┼─┼─┼─┼─┤	
- 30 -								
- 35 -								
- 40 -								
]							
4-								
- 45 -								
- 50 -	Ground	dwater Level	Data			Δ	dvancement Method STRATA BOUNDARIES MAY NOT BE EXACT	
V II		Encountered		0'	- 4': 5	Short-fligh	nt Auger	
 	-	2' after 15 Mi		4'	- 20':	Rotary W	Vash	
- 50 - -						A	bandonment Method	
				Ce	ement	/Bentonite		
								_

PROJECT: Geotechnical Investigation

No. B-44

522113

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

SHEET 1 OF 1

DATE: 7/25/02

FILE:

CLIENT: EAI/WEI

DRILLER: R. Warren TECH.: C. Dawkins

F			DATA			L	ABORA	ATC										LAT: 34 48' 30.8N LONG: 89 53' 46.4W Location:
Depth	oles	Groundwater Level	Field Test	Undrained Shear Strength	Unit V (po	Veight cf)	Other	Pla: Lir	stic	Vatu ar	nd At	Mois tterb Mois Con	erg ture	Con Limi	itent ts	Liquid Limit	Plasticity Index	Surface Elevation: 248.0 ±
(feet)	Samp	Groun	Results	Strength (ksf)	Moist	Dry		"		- — 0			6		 80		PI	DESCRIPTION
			0.50 (P)	0.711	114	84		Ħ		Ž4 —	35	4 3 ⊺ -				_ _	19	Firm tan and light gray silty clay (CL)
		· V	0.50 (P)	0.412 ⁽¹⁾	118	87		-	- — i - — i		- * - •	— † — †		—	- –i	- -		- soft below 2'
5 -		-	1.50 (P)						-		∟35 LI	_ _		— — 1				- firm below 4'
		-	1.50 (P)	0.589 ⁽²⁾	121	96			 	24 -•-	L _ L _	_	 	_	- <u>-</u>			
		-	3.00 (P)	0.000	'				¦	_26		_		i — I				
10 -		-	3.00 (1)					-		_ 3	51 	- +		 				
		-	1.00 (P)					F	- <u>-</u> 2	0 27	33_ - -	— †		— † — ‡		- + -	13	
		-		(0)						 	I L I	_		— + —				- soft below 13'
15 -		-	1.00 (P)	0.450 ⁽³⁾	117	91					L _ } _	_	 		- -	_ <u> </u> _	1	
		-						μj	¦			_		-			1	
20 -		_	3.00 (P)					E	 	<u> </u>	 -	- †			- -	- -	<u> </u>	- firm below 18'
20 -									 		- - 	- - 		,	<u>-</u> ⊢ - '	- -	-	Boring Terminated at 20'
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25 -								Εİ		 		- ¦	 	— —		<u> </u>		
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50 -				Dets				<u> </u>						_		_		STRATA BOUNDARIES MAY NOT BE EXACT
			water Level ncountered		0'	- 4': S	Short-fligh	<u>dvan</u> it Au	ger	ner	t IVI	einc	u					Notes (1) UU Triaxial Compression Test performed at 3 psi
			' 4" after 15		4'	- 20':	Rotary W	/ash										Confining Pressure (2) UU Triaxial Compression Test performed at 5 psi
		_					Al	band	lonr	ner	t Me	etho	od					Confining Pressure (3) UU Triaxial Compression Test performed at 12 ps
					Ce	ement	Bentonite											Confining Pressure
																		√ [®] aquaterra

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

No. B-45

FILE: 522113

SHEET 1 OF 1

DATE: 7/30/02

DRILLER: R. Warren

ENGINEER: D. Coleman

TECH.: C. Dawkins

CLIENT: EAI/WEI

AQ LOG

Jackson, Mississippi

LAT: 34 48' 32.3N LONG: 89 53' 44.7W FIELD DATA LABORATORY DATA Location: Natural Moisture Content Groundwater Level Unit Weight Undrained and Atterberg Limits Field (pcf) Soil Type Depth Shear Samples Plastic Moisture Liquid Other Strength Surface Elevation: 248.0 ± Limit Content Limit (feet) Results (ksf) Moist Dry **DESCRIPTION** ΡI 80 40 Soft tan and light gray silty clay (CL) 2.00 (P) - stiff bleow 2' 1.12⁽¹⁾ 97 16 2.50 (P) 122 - firm below 4' 5 0.954 125 1.50 (P) 102 1.00 (P) - stiff below 8' 1.20(2) 1.00 (P) 123 98 10 2.00 (P) 15 1.50 (P) 1.050 122 97 3.50 (P) 1.490 122 95 17 20 4b/f, 1-2-2 Loose gray clayey sand (SC) 25 3b/f, 1-1-2 30 8b/f, 2-3-5 35 Dense tan sand (SP) - with gravel 41b/f, 15-18-23 40 - very dense below 43' 56+b/f, 18-50+-6 AQUATERR.GDT 45 51b/f, Boring Terminated at 50' 15-24-27 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 4': Short-flight Auger (1) UU Triaxial Compression Test performed at 3 psi Initially Encountered at 3' 4' - 50': Rotary Wash Confining Pressure Boring fell in at 2' 10" (2) UU Triaxial Compression Test perfromed at 3 psi Confining Pressure Abandonment Method Piezometer Well Installed

PROJECT: Geotechnical Investigation

No. B-46

522113

Short Fork Creek WWTF Flinn Site

SHEET 1 OF 1

7/29/02

DeSoto County, Mississippi

DRILLER: R. Warren

FILE:

DATE:

CLIENT: EAI/WEI

TECH.: C. Dawkins

F			DATA			L	ABORA	ATORY DATA LAT: 34 48' 32.0N LONG: 89 53' 47.8W Location:
Depth	Samples	vater	Field	Undrained Shear	Unit W	Veight of)		and Atterberg Limits
(feet)	mples	ouna /el	Test Results	Strength (ksf)	Moist		Other	
	Sa							20 40 60 80 PI DESCRIPTION Medium dense tan and light gray clayey silt (ML)
			2.00 (P)	1.010	110	89		- + - - + - - + - - + - - + -
	-	Ž	0.50 (P)					- + - 2300
5 -			3.00 (P)	1.490	120	96		
			4.50 (P)					medium dense below 5'
	█							19 29
10 -			2.50 (P)					- + - + + + + - 10 Firm tan and light gray slity day (CL)
			0.50 (P)					
			0.00 (1)					
15 -			1.00 (P)	0.815	123	96		- + 19 31 + + + - 12
								- + 19 - + 143 + + +
20 -			2.00 (P)	1.120	122	96		-+
	1							
								Medium dense gray clayey sand (SC)
 25 -			0.50 (P)					
	$\left\{ \ \right\}$							
	\coprod							
30 -	X		4b/f, 2-1-1					
								Medium dense gray sand (SP) - with gravel
35 -	X		24b/f, 5-12-12	L				Boring Terminated at 35'
	1							Boring Terminated at 35
	$\left\{ \ \right\}$							
40 -	1							
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	$\frac{1}{1}$							
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	Grou	ındv	water Level	Data				dvancement Method Notes
		-	ncountered ' 6" after 15		0' 4'	- 4': S - 35':	hort-fligh Rotary W	nt Auger Vash
							Al	bandonment Method
					Ва	ackfille	d with So	oil Cuttings
								èaquateria
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PROJECT: Geotechnical Investigation

No. B-47

522113

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

SHEET 1 OF 1

DATE: 7/26/02
DRILLER: R. Warren

CLIENT: EAI/WEI

TECH.: D. Riley

FILE:

			ATA	Lindrained	Unit W		ABORA		N	atura	al Mo	oisture	e Co	onten	t		<u></u> ≨.	LAT: 34 48' 31.2N LONG: 89 53' 49.3W Location:
epth	es .	Groundwater Level	Field Test	Undrained Shear	(po	cf)	Other	Plast	tic	and		erberg oisture ontent		nits	Liqu Lim	ıid	Plasticity Index	Ourface Flourities 040.0
feet)	Samples	s el	Results	Strength (ksf)	Moist	Dry	C 1	Limi				•				- 4		Surface Elevation: 248.8 ± DESCRIPTION
	ιχ (ב פ						-	20	l 26∣	40	- (60	8	0	\neg	ΡI	Firm tan and gray silty clay (CL)
				0.657	121	92		-+		31		1+-	- -	+-	<u> </u>		20	Timi tan and gray silly clay (CL)
	4	7								- + ·	— - — -	- + - - + -	-	+-	— + — +			
								<u> </u>	- <u> </u> -	_ 30	— <u>İ</u> —	- 	<u>-</u> j	+-	<u> </u>			- stiff below 4'
5 -				1.56 ⁽¹⁾	124	102		\vdash	_ ₂₁	_ + .	_ _	-	-		-			- Still below 4
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				0.657	121	92		-+		31	— <u>İ</u> —	· + -	- <u>i</u>	+-	-+		6	Medium dense tan and gray clayey silt (CL-ML)
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- 1	∟⊥ Groι	undw	ater Level	Data			Ad	dvand	cem	ent	Met	hod						STRATA BOUNDARIES MAY NOT BE EXACT Notes
✓ Ir	nitial	lly En	countered 4" after 15	at 3'	0'	- 20':	Rotary W											(1) UU Triaxial Compression Test performed at 5 ps Confining Pressure
							ΔΙ	ando	nm	ent	Met	hod						
					Ce	ement/	Bentonite			IL								
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PROJECT: Geotechnical Investigation

No. B-48

522113

Short Fork Creek WWTF Flinn Site

SHEET 1 OF 1

7/29/02

DeSoto County, Mississippi

DRILLER: R. Warren

FILE:

DATE:

CLIENT: EAI/WEI

TECH.: C. Dawkins

	ē	DATA	I la dasia a d	Unit V	Veiaht	ABORA	Natural Moisture Content	
Depth	Samples Groundwater Level	Field Test	Undrained Shear Strength	(p	cf)	Other	Natural Moisture Content and Atterberg Limits Plastic Moisture Limit Content Limit Surface Elevation: 249.2 ±	
(feet)	Samp Grour evel	Results	(ksf)	Moist	Dry		Limit — Content — Limit — Surface Elevation: 249.2 ± 20 40 60 80 PI DESCRIPTION	
		, 2.00 (P)					Firm tan and light gray silty clay (CL)	
		0.50 (P)	0.493 ⁽¹⁾	118	90		- + - 23 32 - + + + 9 - soft below 2'	
_	-		0.493	110	90			
5 -	-	0.50 (P)						
		1.00 (P)					- firm below 6'	
		3.00 (P)	1.290	125	102		- stiff below 8'	
10 -								
		0.50 (P)	0.432	122	95		- 19 30	
15 -		0.50 (P)	0.969	120	92			
							<u> </u>	
		3.50 (P)						
20 -							Boring Terminated at 20'	
25 -								
								
30 -							- + - - + - - + - - + - - + - - + - - + - - + - - + -	
35 -								
								
							- + + + + + - + + + +	
40 -							- + + - - + - - + - - + -	
45 -							 	
50 -								
		water Level		n'	_ <u>4'</u> - Q	Ad hort-fligh	ivancement Method Notes Auger (1) UU Triaxial Compression Test Performed	at 3 noi
		Encountered		4'	- 26':	Rotary W	ash (1) OU Triaxial Compression Lest Performed ash	αι ο μεί
		2' after 15 M	nutes					
<u> </u>	ave-in	at 2		D.	okfill-		pandonment Method	
				Ba	ackfille	u WIIN 50	il Cuttings	
							\ ® aquater	

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

No. B-49

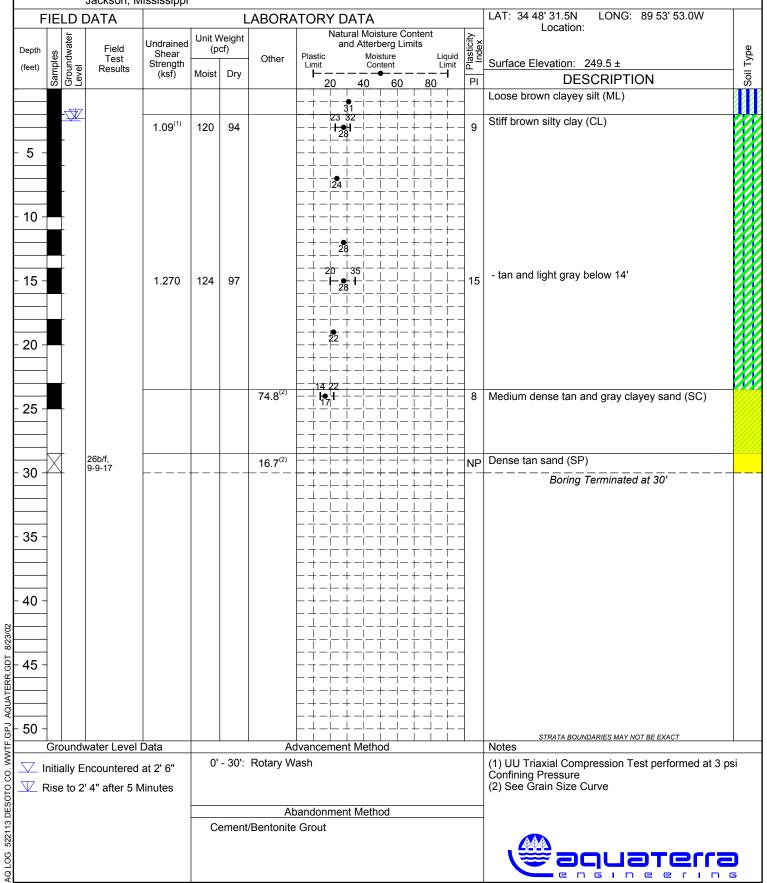
FILE: 522113

SHEET 1 OF 1

DATE: 7/26/02 R. Warren DRILLER:

TECH.: D. Riley

CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi



No. B-50

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site

SHEET 1 OF 1 DeSoto County, Mississippi

FILE: 522113

DATE: 7/26/02

R. Warren DRILLER:

TECH.: D. Riley

CLIENT: EAI/WEI

ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 29.0N LONG: 89 53' 50.5W FIELD DATA LABORATORY DATA Location: Natural Moisture Content Groundwater Level Unit Weight Undrained and Atterberg Limits Field (pcf) Depth Samples Shear Plastic Moisture Liquid Other Strength Surface Elevation: 249.5 ± Limit Content (feet) Results (ksf) Moist Dry Soil **DESCRIPTION** ΡI 80 Loose brown clayey silt (ML) $0.595^{(1)}$ 118 91 9 5 2227 5 10 0.562 121 95 - very loose below 13' 2b/f, WOH-1-1 15 Stiff tan silty clay (CL) 1.080 95 13 122 20 Boring Terminated at 20' 25 30 35 40 45 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Advancement Method Groundwater Level Data Notes 0' - 20': Rotary Wash (1) UU Triaxial Compression Test performed at 3 psi Initially Encountered at 3' Confining Pressure Rise to 2' 6" after 5 Minutes Abandonment Method Cement/Bentonite Grout AQ LOG

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site

DeSoto County, Mississippi

No. B-51

FILE: 522113

DATE: 7/29/02

SHEET 1 OF 1

DRILLER:

R. Warren

TECH.: C. Dawkins ENGINEER: D. Coleman

CLIENT: EAI/WEI

Jackson, Mississippi

		DATA		11-:414		.ABORA	RY DATA Natural Moisture Content LAT: 34 48' 31.2N Location:	LONG: 89 53' 54.8W
Depth	Samples Groundwater	Field	Undrained Shear	Unit V (po	veignt cf)	Other	and Atterberg Limits 📴 👸	
(feet)	Samples Groundwa	Test Results	Strength (ksf)	Moist	Dry	Other		
	S G		, ,				20 10 00 00	SCRIPTION und light gray clayey silt (ML)
		1.00 (P)					- -25+ - - + - - + - - + - - 2431- - + - - + - - + -	ind light gray dayey sitt (WE)
	<u></u>	0.50 (P)	0.744	120	92		- - 	
5 -		4.00 (P)						
	-		4.050	405	400			
	-	2.00 (P)	1.250	125	102			
10 -		4.00 (P)						
10								
		1.50 (P)	1.030	123	98			
							21 38	av silty clay (CL)
15 -		1.00 (P)	0.759	120	93		Firm tan and light gr	,,, (/
		2.50 (P)						
20 -					+			Terminated at 20'
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-								
40								
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45 -								
							++	
50 -								NDARIES MAY NOT BE EXACT
		water Level		٥.	41 3		cement Method Notes	-
	-	Encountered 2' 10" after 1		0' 4'	- 4": S - 20':	Short-fligh Rotary W	er	
							onment Method	
				Pi	ezome	eter Well I	led	
								quaterra

SOIL BORING LOG No. B-52 PROJECT: Geotechnical Investigation FILE: 522113 Short Fork Creek WWTF Flinn Site DATE: 7/26/02 SHEET 1 OF 1 DeSoto County, Mississippi R. Warren DRILLER: TECH.: D. Riley CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 28.6N LONG: 89 54' 53.3W FIELD DATA LABORATORY DATA Location: Samples Groundwater Level Natural Moisture Content Unit Weight Undrained and Atterberg Limits Field (pcf) Depth Shear Plastic Moisture Liquid Other Strength Surface Elevation: 251.4 ± (feet) Limit Content Limit Results Soil . (ksf) Moist Dry **DESCRIPTION** ΡI 80 Loose tan and brown clayey silt (ML) 23 31 8 5 6 10 Boring Terminated at 12' 15 20 25 30 35 40 45 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 12': Short-flight Auger ✓ Initially Encountered at 5' Rise to 3' 5" after 15 Minutes Abandonment Method Backfilled with Soil Cuttings AQ LOG

SOIL BORING LOG No. B-53 PROJECT: Geotechnical Investigation FILE: 522113 Short Fork Creek WWTF Flinn Site DATE: 7/29/02 SHEET 1 OF 1 DeSoto County, Mississippi DRILLER: R. Warren TECH.: C. Dawkins CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 23.5N LONG: 89 53 54.9W FIELD DATA LABORATORY DATA Location: Samples Groundwater Level Natural Moisture Content Unit Weight Undrained and Atterberg Limits Field (pcf) Depth Shear Plastic Moisture Liquid Other Strength Surface Elevation: 248.8 ± (feet) Limit Content Limit Results Soil (ksf) Moist Dry **DESCRIPTION** ΡI 80 Loose tan clayey silt (ML) 26134 8 5 Firm tan silty clay (CL) 10 10 Boring Terminated at 12' 15 20 25 30 35 40 45 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 12': Short-flight Auger Initially Encountered at 4' 6" No Rise Observed Abandonment Method Piezometer Well Installed AQ LOG

AQUATERR.GDT

SOIL BORING LOG No. B-54 FILE: PROJECT: Geotechnical Investigation 522113 Short Fork Creek WWTF Flinn Site DATE: 7/26/02 SHEET 1 OF 1 DeSoto County, Mississippi DRILLER: R. Warren TECH.: C. Dawkins CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 19.1N LONG: 89 54' 2.3W FIELD DATA LABORATORY DATA Location: Samples Groundwater Level Natural Moisture Content Unit Weight Undrained and Atterberg Limits Field (pcf) Depth Shear Plastic Moisture Liquid Other Strength Surface Elevation: 249.0 ± (feet) Limit Content Limit Results Soil (ksf) Moist Dry **DESCRIPTION** ΡI 80 Loose brown clayey silt (ML) 10 5 - medium dense tan and brown below 5.5' 3 10 Boring Terminated at 12' 15 20 25 30 35 40 45 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 12': Short-flight Auger Initially Encountered at 4' Rise to 3' 2" after 15 Minutes Abandonment Method Backfilled with Soil Cuttings AQ LOG

AQUATERR.GDT

SOIL BORING LOG No. B-55 PROJECT: Geotechnical Investigation FILE: 522113 Short Fork Creek WWTF Flinn Site 7-26-02 DATE: SHEET 1 OF 1 DeSoto County, Mississippi DRILLER: R. Warren TECH.: C. Dawkins CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 19.2N LONG: 89 53' 52.4W FIELD DATA LABORATORY DATA Location: Samples Groundwater Level Natural Moisture Content Unit Weight Undrained and Atterberg Limits Soil Type Field (pcf) Depth Shear Plastic Moisture Liquid Other Strength Surface Elevation: 249.5 ± (feet) Limit Content Limit Results (ksf) Moist Dry **DESCRIPTION** ΡI 80 Firm brown silty clay (CL) 5 - tan below 5.5' - tan and gray below 8.5' 10 Boring Terminated at 12' 15 20 25 30 35 40 45 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 12': Short-flight Auger Initially Encountered at 4' Rise to 2' 9" after 15 Minutes Abandonment Method Backfilled with Soil Cuttings AQ LOG

SOIL BORING LOG No. B-56 PROJECT: Geotechnical Investigation FILE: 522113 Short Fork Creek WWTF Flinn Site DATE: 7/26/02 SHEET 1 OF 1 DeSoto County, Mississippi DRILLER: R. Warren TECH.: C. Dawkins CLIENT: EAI/WEI ENGINEER: D. Coleman Jackson, Mississippi LAT: 34 48' 15.0N LONG: 89 53' 43.0W FIELD DATA LABORATORY DATA Location: Samples Groundwater Level Natural Moisture Content Unit Weight Undrained and Atterberg Limits Field (pcf) Depth Shear Plastic Moisture Liquid Other Strength Surface Elevation: 247.5 ± (feet) Limit Content Limit Results Soil . (ksf) Moist Dry **DESCRIPTION** ΡI 80 Soft tan and brown silty clay (CL) 5 - firm below 7' 26 10 - stiff below 10' Boring Terminated at 12' 15 20 25 30 35 40 45 522113 DESOTO CO. WWTF.GPJ 50 STRATA BOUNDARIES MAY NOT BE EXACT Groundwater Level Data Advancement Method Notes 0' - 12': Short-flight Auger ✓ Initially Encountered at 3' Rise to 2' 4" after 15 Minutes Abandonment Method Backfilled with Soil Cuttings AQ LOG

PROJECT: Geotechnical Investigation

Short Fork Creek WWTF Flinn Site DeSoto County, Mississippi

No. B-57

FILE: 522113 DATE: 7/26/02

SHEET 1 OF 1

DRILLER: R. Warren

C. Dawkins

CLIENT: EAI/WEI

Jackson, Mississippi

ENGINEER: D. Coleman

TECH.:

FIELD DA	TA		LABORA	ATORY DATA	LAT: 34 48' 11.0N LONG: 89 53' 42.0W
ter	Field Undrained	Unit Weight (pcf)		Natural Moisture Content and Atterberg Limits	Location:
Samples (teet) (teet) (Tevel	Shear	(pcf)	Other	Plastic Moisture Liquid	Surface Elevation: 246.0 ± DESCRIPTION
Samples (teet) Roondwije (teet) Roondwij	Results Strength (ksf)	Moist Dry		-	Surface Elevation: 246.0 ±
% 53	. ,			20 40 60 80 PI	DESCRIPTION Soft brown clay (CH)
				- + - 2	Soft brown day (CH)
				-+- 24+- -+54- -+- -+	- very soft below 2'
				- + - - + - - + - - + -	8
5					- soft below 4'
					Firm gray silty clay (CL)
10 -					
		$oxed{L}_{-}oxed{L}_{-}$			
					Boring Terminated at 12'
				<u> </u>	
15 -					
20 -				<u> </u>	
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25 -					
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50 -					
	er Level Data		Ac	United the second secon	STRATA BOUNDARIES MAY NOT BE EXACT Notes
		0' - 12':	Short-flig		
Initially Enco			3	-	
	" after 15 Minutes				
			Ab	pandonment Method	
		Backfille		il Cuttings	_
					ensineerins

PROJECT: Geotechnical Investigation

No. B-58

522113

Short Fork Creek WWTF Flinn Site DeSoto County, Mississippi

SHEET 1 OF 1

DATE: 7/30/02
DRILLER: R. Warren

FILE:

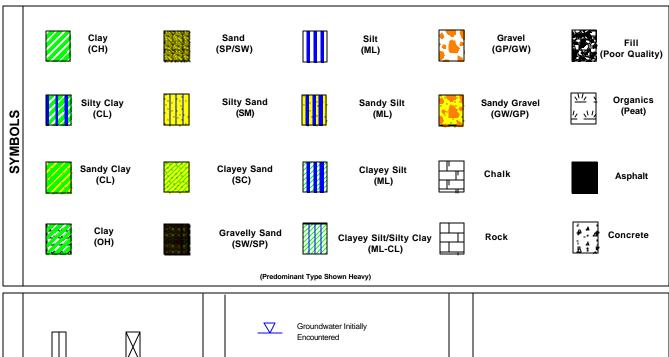
CLIENT: EAI/WEI

TECH.: C. Dawkins

F	IEI	_D [DATA			I	_ABORA	ATOF	RY D	ATA					LAT: 34 49' 50.0N LONG: 89 53' 10.0W Location:	
		ater	Fills	Undrained	Unit V	Veight			Natu	ral Mo d Atte	isture Co	nten	t	s city	Location.	
Depth	səlc	ndw.	Field Test	Shear Strength	(p	cf)	Other	Plasti	c	Мс	nisture ontent		Liquid Limit	Plasticity Index	Surface Elevation: 253.0 ±	
(feet)	Sam	Groundwater Level	Results	(ksf)	Moist	Dry		-	20	40	60	 8		PI	DESCRIPTION	- lioo
			1.50 (P)							- j	+ - -	T 1			Medium dense tan and clayey silt (ML)	
		-		0.004	400	00		H +	- 25 263	1- -	+- -	+-	- -	_		
		-	1.50 (P)	0.394	109	89		F # :	23 +		+ - -	+ -	— —	5		
- 5 -			1.00 (P)					<u> </u>	- - 	5- -		$\perp \perp$	_	1	- loose below 4'	
		-	2.50 (P)	0.868	121	97					<u> </u>	<u> </u>			- medium dense below 8'	
		-						H+-	25	-	+	+	- -	1		
- 10 -		-	1.00 (P)					F +	- - † - - +	-	+ - -	+	— 			
			4 00 (D)					H+.	2428	- –j–	+- -	+-	- -			
			1.00 (P)					F # :	28		+ - -	+-		4		
15		-	0 00 (D)					<u> </u>	_	- -	+- -	<u> </u>	- -			
15 -		-	2.00 (P)					F ‡	25		<u> </u>	<u> </u>				
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		-	2.00 (P)	1.230	128	104		- +	20 28 - 😓 H	-	+- -	+-	- + -	8	Stiff tan and light gray silty clay (CL)	
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								F + .	_ _ +	_ _	+ - -	+ -				
		-	2 50 (D)	0.000	100	101		H+-	_	-	<u> </u>	$\perp \perp$	- -	1	- firm below 23'	
25 -		-	250 (P)	0.896	126	101		FŢ.	25		<u> </u>	ĻΞ				
								H+-	- -		+	$\vdash \exists$	- - -	1		
		-						F +1	- - † 5 23 †	-	+	T –	 -			
20			0.50 (P)	0.586	127	103		F + .	H ₂₃ +	· –j–	+- -	+-	- -	8	- gray below 28.5'	
- 30 -	П	-					T	F#:	_ _ +	-	+ - -	+ -			Boring Terminated at 30'	
	H							<u> </u>	_ _ +	-	+ - -	<u> </u>	- -			
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35 -	H							<u> </u>	- - +	-	† - -	+-	- <u> </u> -	1		
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- 50 -								<u> </u>		-	<u> </u>	<u> </u>	_		STRATA BOUNDARIES MAY NOT BE EXACT	
			water Level		01	401			ement	Meth	nod				Notes	
		-	ncountered	at 13'	16	- 16" 3' -30'	Short-flig Rotary V	πι Au(Vash	yer							
<u> </u>	Cav	e-in a	at 12' 6"				•									
							Ak	bando	nmen	t Meth	nod					
							ed with Ce	ment	Bento/	nite C	Frout an	d Sc	oil			
					"	onditio	ons								√ ∰aquaterra	
					1										, , , , , , , , , , , , , , , , , , ,	



SOIL BORING LEGEND



	Auger	Split Spoon		Groundwater Initially Encountered Groundwater Level After a Specified Period of Time		(P) (T)	Pocket Penetrometer Torvane
SAMPLING	Shelby Tube	Probe Core	GROUNDWATER	Static Groundwater Level After a Specified Period of Time	FIELD TESTS	(b/f) (PID) (OVA)	Standard Penetration Test (blows per foot) Photo-Ionization Detector Organic Vapor Analyzer
	No Recovery	Rock Core	GF	 ND - Not Determined; as the presence of groundwater is masked in borings advanced with rotary wash methods. Actual depth to water may vary from the conditions observed in the borings. 			

(More than 50% reta Includes g Dens	ohesive Soils ined on No. 200 sieve.) ravels, sands and silts. ity determined by Penetration Resistance.	(50% or more _l Consistency determi	passing the No. 200 sieve.) ined by laboratory shear strength d visual-manual procedures.
Descriptive Term (Density)	Standard Penetration Resistance (blows per foot)	Descriptive Term (Consistency)	Undrained Shear Strength (kips per square foot)
Very Loose	less than 4	Very Soft	less than 0.25
Loose	5 to 9	Soft	0.25 to 0.50
Medium Dense	10 to 29	Firm	0.50 to 1.00
Dense	30 to 50	Stiff	1.00 to 2.00
Very Dense	above 50	Very Stiff	2.00 to 4.00
		Hard	above 4.00



TERMS USED ON BORING LOGS



COBBLES -Greater than 3 inches

> Coarse - 3/4 inch to 3 inches Fine - 4.76 mm to 3/4 inch

Coarse - 3/4 mm to 4 76 mm

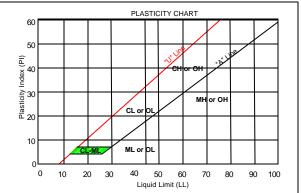
Medium - 0.42 mm to 2 mm

Fine - 0.074 mm to 0.42 mm

SII T and CLAY-Less than 0.074 mm

GRAVEL -

SAND -



CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

0 - 5%

5 to 15%

15 to 29%

30 to 50%

TRACE -

WITH -

SANDY or

GRAVELLY-

SLIGHTLY -

ASTM Designation: D 2487 - 93 (Based on Unified Soil Classification System)

	MAJOR DIVISIONS SOIL CLASSIFICATION			SOIL CLASSIFICATION
			Group Symbo	Group Name
COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve)	GRAVELS (More than half of coarse fraction larger than No. 4 sieve)		GW	WELL GRADED GRAVEL , GRAVEL-SAND MIXTURE
		Clean Gravel (little or no fines)	GM	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		Gravel with Fines (appreciable amount of fines)	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-CLAY-SAND MIXTURE
			SW	WELL GRADED SAND, GRAVELLY SAND
	SANDS	Clean Sands (litte or no fines)	SP	POORLY GRADED SAND, GRAVELLY SAND
	(More than half of coarse fraction smaller than No. 4 sieve)	Sands with Fines (appreciable amount of fines)	SM	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			SC	CLAYEY SAND, SAND-CLAY MIXTURE
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS and CLAYS	(Liquid Limits less than 50)	ML	SILT WITH LITTLE OR NO PLASTICITY
			ML	CLAYEY SILT, SILT WITH SLIGHT TO MEDIUM PLASTICITY
			CL	SILTY CLAY, LOW TO MEDIUM PLASTICITY
			CL	SANDY CLAY, LOW TO MEDIUM PLASTICITY
	(Liquid Limit less than 50)	(Liquid Limits greater than 50)	MH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY
			СН	CLAY, HIGH PLASTICITY
			ОН	ORGANIC CLAY, MEDIUM TO HIGH PLASTICITY
			PT	PEAT, HUMUS, SWAMP SOIL

BLOCKY - HAVING A STRUCTURE THAT CAN BE BROKEN DOWN INTO SMALLER ANGULAR LUMPS WHICH RESIST FURTHER BREAKDOWN

CALCAREOUS - CONTAINING APPRECIABLE QUANTITIES OF CALCIUM CARBONATE

FISSURED - HAVING DEFINITE PLANES OF FRACTURE WITH LITTLE RESISTENCE TO FRACTURING

FRIABLE - EASILY CRUMBLED

GLAUCONITIC - CONTAINING A GREEN, PEPPERLIKE MINERAL COMMONLY OCCURRING IN SOILS OF MARINE ORIGIN

HOMOGENEOUS - HAVING THE SAME COLOR AND APPREARANCE THROUGHOUT

JOINTED - A FISSURED CONDITION WITH FRACTURE PLANES THAT ARE NUMEROUS AND LIMITED IN EXTENT

INDURATED - HARDENED BY PRESSURE OR CEMENTATION

LAYER - A SOIL DEPOSIT WITH A THICKNESS OF ABOUT SIX INCHES

ORGANIC - CONTAINING REMAINS OF LIVING ORGANISMS

PARTING - A VERY SMALL THICKNESS OF SOIL WITHIN ANOTHER SOIL

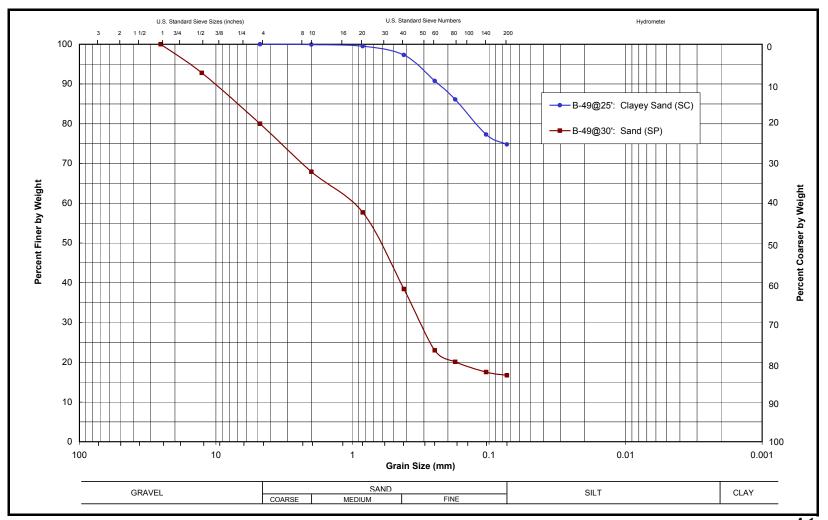
SEAM - A BED OF SOIL LESS THAN SIX INCHES THICK DEPOSITED WITHIN ANOTHER SOIL MASS

SLICKENSIDED - HAVING FRACTURE PLANES THAT APPEAR POLISHED AND GLOSSY

STRATIFIED - COMPOSED OF ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR







A-1